HUDBAY

February 1, 2018

Mr. William James
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Ms. Deanna Cummings
Senior Regulatory Project Manager
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Re: Response to EPA Comments - Environmental Consequences of the Proposed Rosemont Copper Mine: Significant Degradation to Waters of the United States October 5, 2017 (Revised November 30, 2017)
Rosemont Copper Project, Clean Water Act Section 404 Permit, CoE File No.: 2008-00816-MB

Dear Mr. James and Ms. Cummings:

On December 1, 2017, the U.S. Army Corps of Engineers (Corps) transmitted a copy of EPA comments entitled *Environmental Consequences of the Proposed Rosemont Copper Mine: Significant Degradation to Waters of the United States dated November 30, 2017 to Rosemont Copper* (Rosemont). Rosemont and its technical consultants, WestLand Resources, Water and Earth Technologies, and Tetra Tech, have reviewed the EPA comments and provide the attached report in response.

Current regulations prohibit the discharge of fill material to waters of the U.S. (WOTUS) if that discharge will cause significant degradation to WOTUS, based on factual determinations, evaluations, and tests outlined at 40 CFR 230.10(c). Rosemont understands that the EPA has in the past asserted to the Corps that the Rosemont Copper Project (Project) will result in significant degradation to WOTUS, though this was our first opportunity to review the EPA's evaluation in reaching that determination.

The comments prepared by EPA attempted to evaluate the Project's discharge of fill with respect to the requirements within the rule (40 CFR 230); however, as demonstrated in the attached report, the EPA's evaluation fails to demonstrate significant degradation. There were several flaws in the EPA analysis that became apparent:

- The EPA's analysis relied extensively on potential Project impacts unrelated to the discharge of fill material to WOTUS, specifically the modeled and highly uncertain affects of groundwater drawdown on aquatic resources in Empire Gulch and Cienega Creek. Not only are these potential effects highly speculative and outside the activity requiring a CWA Section 404 permit, they are substantially overstated in the Final Environmental Impact Statement (FEIS) and the Biological Option (BiOp) completed for the Project. We address these issues fully in a separate report

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responding to a separate EPA comment memorandum regarding groundwater drawdown resulting from the Project.

- The EPA consistently overstates the value of the onsite aquatic resources at the Project. The potential WOTUS to be impacted by the Project are ephemeral washes, the largest of which function as maintained Forest Service roads. The FEIS and EPA overstate the extent of xeroriparian habitat impacted by the Project (which generally occurs outside the ordinary high water mark of the ephemeral washes) because both rely on mapping by Pima County, which has been demonstrated to overestimate the aerial extent of riparian habitat. The EPA also asserts that three different classes of special aquatic sites will be impacted by the Project, none of which occur within the Project footprint.
- The EPA failed to acknowledge the extensive and substantive mitigation measures that have been brought forward by Rosemont and disclosed in the FEIS. Many of these mitigation measures have been designed to offset the impacts that the EPA is citing. While there are one hundred (100) pages of mitigation analyzed and disclosed by the Forest Service in Appendix B of the FEIS, the EPA only addresses those mitigation measures described in the habitat mitigation and monitoring plan (HMMP), which are provided only for those impacts to WOTUS resulting from the discharge of fill material. The mitigation measures in the FEIS address potential impacts to aquatic resources well beyond the federally permitted fill activity.

Rosemont found EPA's comment letter disjointed, repetitive, and rather poorly organized. In order to ensure that each EPA comment was addressed, our response is provided in table format, with each individual comment in a single row and Rosemont's response in the adjoining column. While the table itself is repetitive because of the EPA statements, this seemed to be the most effective way to provide direct feedback to each statement.

As noted above, Rosemont is also preparing substantive comments on the groundwater drawdown effects evaluation prepared by EPA and has previously replied to the EPA comments on the HMMP (January 25, 2018). Rosemont disagrees with the overall EPA theme of evaluation of secondary effects, drawdown, for a permit for a fill activity.

If you have questions or require further information regarding this topic, I can be reached at (520) 495-3502 or via email at kathy.arnold@hudbayminerals.com.

Regards,

Katherine Ann Arnold, PE
Director, Environment

Attach: *Rosemont Response (matrix) to EPA Letter entitled "Environmental Consequences of the Proposed Rosemont Copper Mine: Significant Degradation to Waters of the United States*

cc: File

Doc. No. 007/18-15.2.1

EPA Comment	Rosemont Response
The Rosemont Mine Will Cause or Contribute to Significant Degradation of Waters of the United States.	
Fundamental to the Guidelines is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.[1] Specifically, the Guidelines provide that discharges are not permitted if they will cause or contribute to significant degradation of waters (40 CFR 230.10(c)).[2] [1] Guidelines for the Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230) [2]As stated in Preamble to the Guidelines, Other Requirements for Discharge "significant" means more than trivial (p. 85343).	This is true as stated, however findings of significant degradation are required to be based upon appropriate *factual* determinations, evaluations, and tests required by Subparts B and G and after consideration of Subparts C-F with special emphasis on the persistence and permanence of the effects outlined in those subparts. Rosemont believes that those determination requirements have not been met and responds to each comment associated with the EPA comment in turn.
EPA's findings of significant degradation to the physical, chemical and biological components of the aquatic ecosystem are based upon factual determinations required under the Guidelines by Subparts B and G, and consideration of Subparts C-F, with special emphasis on the persistence and permanence of the direct and secondary effects outlined in these subparts.	Rosemont disagrees with this statement, for the reasons enumerated below.
Construction of the Rosemont Mine will result in the permanent filling and loss of 40.4 acres of jurisdictional substrate of streams covering 18 linear miles. An additional 8.9 acres of Sonoita Creek will be filled at Sonoita Creek Ranch. This will result in a permanent and irrevocable significant adverse effect to the aquatic ecosystem by altering the substrate elevations and bottom contours of waters; jurisdictional waters will be permanently filled and all ecological functions associated with the jurisdictional substrate will be lost.[3] [3] See Appendix A: Environmental Setting and Significance and EPA Analysis dated November 30, 2017 of the *Final Habitat Mitigation and Monitoring Plan Permit NO. SPL-2008-00816-MB Rosemont Copper Project dated September 12,* 2017.	Here the EPA simply describes the result of fill activity in waters of the U.S., which by definition will alter the substrate elevations or convert them to dry land. While the statement is true on its face, there is nothing remarkable, or significant, about the effects described here. In addition, it should be noted that the definition of an "aquatic ecosystem" in 40 CFR.3(c) is *waters of the United States, including wetlands, that serve as habitat for interrelated and interacting communities and populations of plants and animals.* While the use of the dry washes in the ephemeral system that Rosemont proposes to fill is well documented in the FEIS, the plants and animals associated with these washes can and do live throughout the uplands as well as the drainages. The majority of the vegetation in the fill area is xeroriparian (with a possible exception at one spring) and the largest drainages are numbered forest service roads. So while the system is altered, the use and function of the area will be reclaimed and still available for the wildlife and plants that currently use the system.
The direct filling of the stream substrate will result in direct and secondary adverse effects to the ecological functions at the discharge sites and in adjoining downstream tributaries through changes in flow patterns, water circulation, sediment storage and transport and various water quality parameters. The discharge of fill material into jurisdictional streams, seeps and springs and the associated denuding, grading and re-contouring of adjacent contributing watershed landscapes will permanently and adversely alter all existing natural physical and chemical characteristics, and functions of the aquatic ecosystem at the project site. In addition, the project will result in permanent significant adverse effects to flows and normal surface and groundwater fluctuations of high functioning receiving waters through the direct discharge of fill material and through secondary impacts resulting from stormflow diversion, changes in channel morphology through erosion, contamination and elevated levels of suspended sediment in the water column.	The mitigation rule contemplates the changes itemized and allows mitigation to compensate for these changes. This statement is primarily opinion on the part of EPA and not backed up by the evaluation or the impact analysis performed for the FEIS. Discussions in the FEIS at Table 21 show that the watersheds within the area are functioning "at risk" and not "high functioning" as stated by the EPA. The fill activity area and the receiving waters are encompassed by Davidson Canyon in Table 21.

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	Table 21. Watershed condition classification within the analysis area

Indicator	Box Canyon Wash	Davidson Canyon*	Sycamore Canyon	Fortynine Wash–Cienega Creek†	Empire Gulch
Aquatic biota	Fair	Fair	Fair	Fair	Good
Riparian/watershed vegetation	Fair	Fair	Fair	Fair	Fair
Water quality	Good	Good	Good	Good	Good
Water quantity	Fair	Fair	Good	Fair	Fair
Aquatic habitat	Fair	Fair	Fair	Fair	Fair
Roads and trails	Fair	Fair	Fair	Fair	Fair
Soil	Fair	Good	Fair	Good	Good
Forest cover	Good	--	--	--	Good
Forest health	Good	Good	Good	Good	Good
Terrestrial invasive species	Fair	Fair	Fair	Fair	Fair
Rangeland vegetation	Fair	Fair	Fair	Good	Fair
Overall watershed condition classification	Functioning -- at risk	Functioning -- at risk	Functioning -- at risk	Functioning -- at risk	Functioning -- at risk

Notes:
-- = The indicator is not applicable to these watersheds.

Explanation of ratings (Potyondy and Geier 2011):
Good – A rating of "good" is the expected indicator value in a watershed with high geomorphic, hydrologic, and biotic integrity relative to its natural potential condition, and it suggests that the watershed is functioning properly with respect to that indicator.
Fair – A rating of "fair" is the expected indicator value in a watershed with moderate geomorphic, hydrologic, and biotic integrity relative to its natural potential condition, and it suggests that the watershed is functioning at risk with respect to that indicator.
Poor – A rating of "poor" is the expected indicator value in a watershed with moderate geomorphic, hydrologic, and biotic integrity relative to its natural potential condition, and it suggests that the watershed is functioning at unacceptable risk with respect to that indicator
Functioning – at risk – The rating "functioning – at risk" is an overall assessment of the overall state of the watershed, based on the combined individual indicator values, and it indicates that the watershed has only moderate geomorphic, hydrologic, and biotic integrity relative to its natural potential condition.

* This watershed includes the areas encompassed by the waste rock, tailings, and plant site facilities. This watershed corresponds to the following watersheds analyzed in the "Surface Water Quantity" resource section of the EIS: Davidson Canyon, Mulberry Canyon, Papago Canyon, Scholefield Canyon, McCleary Canyon, Wasp Canyon, Barrel Canyon, Upper Barrel Canyon, and East Canyon.

† This watershed corresponds to the following watersheds analyzed in the "Surface Water Quantity" resource section of the EIS: Oak Tree Canyon and North Canyon.

Secondary effects from increased scour will result in significant changes to water quality by increasing total suspended sediment and turbidity in surface water flows. Elevated levels of suspended sediment or moderate-to-high turbidity will have significant adverse effects on aquatic organisms in Barrel and Davidson Canyon Washes and Cienega Creek. Increased suspended sediment and turbidity will smother aquatic organisms as sediments settle out. Increases in turbidity can be expected to disrupt the feeding, movement, spawning, and rearing of aquatic organisms such as native fish and amphibians.	EPA's statements appear to be opinion rather than analysis. Table 97 (pg. 447) of the FEIS indicates that sediment load would decrease but sediment concentrations would remain the same, compared with baseline; analysis indicates that no changes in geomorphology (scour/aggradation) are expected in Barrel Canyon or Davidson Canyon owing to change in sediment load. FEIS (pg. 465) states that Patterson and Annandale (2012) have determined that (1) Barrel Canyon is a sediment-transport limited system and (2) there are two grade controls between the project area and the confluence of Barrel and Davidson Canyons. Because of this, Rosemont would not have a significant impact to the geomorphology of Barrel and Davidson Canyons. Because sediment concentrations would not fundamentally change, there would be no more anticipated "smothering" of aquatic organisms than occurs currently under baseline conditions.
The discharge of fill material will permanently and significantly change the chemistry and the physical characteristics of the receiving water below the mine site through the introduction of heavy metals and constituents in suspended and dissolved forms. The addition of contaminants will reduce the suitability of downstream waters for populations of aquatic organisms. Decreases in surface (stormwater) discharges from the mine site will directly and permanently alter existing surface and baseflow hydrologic contributions to downstream receiving waters resulting in changes to the quantity and quality of existing high functioning waters. Thus, there will be adverse changes in the location, dimensions, structure, and dynamics of aquatic communities living in the receiving waters. Suitable living areas will be reduced and normal movement restricted for aquatic organisms. Normal water-level fluctuation patterns will be altered contributing to higher water temperatures and lower dissolved oxygen.	The fill material testing has shown that the runoff can be expected to be better than the current baseline stormwater at the site. In fact, based on calculations performed for the FEIS Table 105, only one element in the waste rock, silver, shows the potential to exceed stormwater standards applicable at Rosemont. ADEQ reviewed the same data and found little likelihood that dissolved silver would exceed the surface water quality standards. The applicable standards for Barren Canyon and its tributaries are Aquatic and Wildlife - ephemeral (acute) and Partial Body Contact. ADEQ reviewed the stormwater data collected from Barrel Canyon and its tributaries, of the 37 samples collected for dissolved silver 26 had both a dissolved silver concentration and a hardness value reported. Twenty-three of those samples were below the applicable Surface water quality standards for dissolved silver based on the in-stream hardness at the time of sampling. At a predicted dissolved silver concentration in the stormwater runoff from the waste rock of 2.5 ug/l, the hardness would have to be approximately 85 mg/l as CaCO3 result in a calculated standard that could be exceeded. This hardness is very low for a hard rock mining area. The average hardness in the area is 611 mg/l with 60% of those samples being 350 mg/l or greater. Contrary to the

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	FEIS discussion on page 472-473, ADEQ does not find it likely that dissolved silver will exceed surface water quality standards in runoff from the waste rock facility. (ADEQ Fact Sheet State 401 Certification Decision dated Feb 3, 2015, pages 7-8)
The discharge of fill material will result in direct and secondary effects on endangered species and other aquatic organisms and wildlife through the physical and chemical modification of the aquatic ecosystem. Exposure of aquatic food web organisms to elevated dissolved and suspended contaminants and suspended particulates and reductions in surface (stormwater) flows from the mine site will result in population declines or bioaccumulation in aquatic food web organisms at lower trophic levels, especially aquatic invertebrates consumed by other fish and wildlife. A reduction or elimination of food chain organism populations decreases the productivity and nutrient export capability of the aquatic ecosystem.	In all cases, the calculated pollutant discharge from the Rosemont Project is less than the current stormwater runoff from the mineralized area. The fill activity therefore appears to reduce the impact of dissolved and suspended analytes (FEIS pages 472-473 and ADEQ Fact Sheet for 401 Certification). The existing aquatic ecosystems in Barrel and Davidson canyons are limited to temporary pools that might exist following precipitation events, as these systems are considered to be ephemeral (FEIS pg. 466). Given that 1) aquatic organisms that inhabit ephemeral systems have evolved solutions, such as dispersal and diapause mechanisms, to address the constraints that ephemeral aquatic environments impose (see e.g., Swartz and Jenkins 2000), 2) the predicted reduction in stormwater flow in Davidson Canyon is predicted to be minimal (4.3 percent) (FEIS pg. 430), and 3) no exceedances of surface water quality standards that are not already exceeded in natural runoff in Barrel Canyon are expected (FEIS pg. 663), this comment is unsubstantiated and contrary to the analyses provided by the FEIS. Moreover, the two springs that are reported to support surface water in Davidson Canyon by the FEIS are in lower Davidson Canyon (Reach 2 and Escondido Springs) where effects will be attenuated and no impacts to spring flow, stream flow, or riparian vegetation are expected (FEIS pg. 663).
Three of the six Special Aquatic Site types described in Subpart E of the Guidelines occur on or adjacent to the proposed project and would be adversely affected by the Rosemont Mine. Because of their special ecological characteristics of high food-web productivity, physical habitat critical for all life stages of aquatic life, water quality functions, and other important and easily disrupted ecological functions, these aquatic resources are given special recognition under Clean Water Act (CWA) regulations.[4] Collectively, the Special Aquatic Sites in the project area play a regionally significant role in maintaining the existing, high quality functions and services in this watershed: sanctuaries and refuges; wetlands and riffle and pool complexes. The discharge of dredged and fill material at the mine site will disrupt breeding and migratory movement of resident and transient wildlife between designated sanctuaries and refuges. In addition, filling natural landscapes will create incompatible human uses and access, including the establishment of undesirable exotic plants adjacent to sanctuaries and refuges. Finally, the discharge of fill will change the balance of water supporting fish and wildlife habitat in downstream refuges. [4] See Guidelines, Subpart E: Sanctuaries and refuges (40 CFR 230.40); wetlands (40 CFR 230.41) and riffle and pool complexes (40 CFR 230.45).	Special aquatic sites include 1. Sanctuaries and refuges - there is no discharge of fill material into any sanctuary or refuge. The nearest is the Las Cienegas National Conservation Area (LCNCA) which has a fenceline and uplands approximately 2 miles away. 2. Wetlands - there are no wetlands within the project where there is discharge of fill material. The nearest wetland is at a spring (Scholefield Spring) which is nearly 1.5 miles from the nearest fill activity. 3. Mud Flats - there are no mud flats at or near the site. 4. Vegetated shallows - There are no vegetated shallows at or near the site. 5. Coral Reefs - there are no coral reefs at or near the site. 6. Riffle and pool complexes - The entire system on-site and downstream for 12-miles is ephemeral; after that 12 miles there is an intermittent stretch followed by additional ephemeral system and then another intermittent system. On-site direct effects to the ephemeral system will occur however because the system is sediment transport limited the downstream effects will be far less than described by EPA. The fill will not affect the movement of wildlife between designated sanctuaries or refuges. The Forest Service has required an extensive revegetation and invasive species monitoring program that has not been recognized by EPA in their analysis. Fish supported downstream may be affected by a calculated stormwater runoff decrease of 4.3% (FEIS pg. 430) at the confluence of Davidson and Lower Cienega Creek (dependent upon location of storms and amount of rainfall). The pool locations are downstream from this confluence and are not dependent solely on the Davidson Canyon area for runoff. The whole of the Cienega Creek Drainage feeds this area (where Pantano Wash becomes Cienega Creek) making the contribution from Rosemont less than 1% (page 2 http://rosemonteis.us/files/references/zeller-2011a.pdf Rosemont FEIS References) at a location that is more than 15 miles downstream.
Riffle and pool complexes are particularly valuable habitat for wildlife at the mine site. This is because flowing riffles and pools provide temporary breeding habitat for certain aquatic insects and amphibians, and provide sources of drinking water for organisms that persists following cessation of rainfall in an otherwise arid landscape. All pool and riffle complexes at the mine site receiving fill material will be permanently lost. Wetlands and riffle-pool complexes will also be adversely affected by the secondary effects of project-induced decreases in stormwater contributions to baseflow from the proposed project. Decreases in baseflow linked to decreased stormwater flows from the mine will change and disrupt breeding, spawning, rearing, and migratory movements, or other critical life history requirements of fish and wildlife resources. For example, pools and riffles within the lower Cienega Creek used by Gila chub, Gila topminnow, and longfin dace would be especially vulnerable to desiccation during the typically driest months of May and June, and/or during droughts when these intermittent pools are embedded within long reaches of dry streambed. Seemingly small reductions in streamflow caused by the mine during critically dry months could cause portions of Cienega Creek to stop flowing.[5]	Riffle and pool complexes are specifically not found at the Rosemont site – Table 103 in the DEIS (pg. 336) lists the Special Aquatic Sites and only one was identified in an alternative that was not chosen. This same evaluation is found in Table 103 of the FEIS (pg. 463). The function of riffle and pool complexes that allows them to be considered special aquatic sites relates specifically to perennial, or possibly intermittent, flow regimes, where the riffles and pools provide specific habitat needs for aquatic organisms. Any riffles and pools that may result from ephemeral flows are so short-lived that they would not rise to the level of a special aquatic site. It is notable that in their report describing the significance of ephemeral and intermittent stream systems in the arid southwest, Levick, et al (2008)[1] do not address riffle and pool systems at all. While occasional pools may persist for some short period of time in these systems, they do not represent a riffle and pool system that rises to the level of a special aquatic site. Cienega Creek evaluations by the BLM included in the First Supplemental Information Report prepared by the Forest Service (May 22, 2015) showed a trend of reduction for pool complexes Table 5 and Figure 3 (pg. 57) and Figure 4 of that report show changes over the past 20+ years with a downward trend in the lower reaches. Changes were made to the DEIS based on comments by EPA; those changes are detailed in the record in a Process Memorandum (record number 049728). Further adjustments were made during the first Supplemental Information Report which were further refined in

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[5] DEIS, p. 387.	the Reinitiated Amended BO developed in 2016. Page 80 in the Amended BO states the impact on streamflow is zero and the effect on pools is fairly limited. Impacts to the fish discussed were thoroughly disclosed in the Amended BO. Regarding Gila chub, Gila topminnow, and longfin dace, the FEIS also states "*A range of outcomes was assessed for Cienega Creek, all of which have high levels of uncertainty due to the long time frames, long distances, and small amounts of drawdown involved. The most likely scenario suggests that noticeable reductions in stream flow in Cienega Creek would not occur for hundreds of years after closure and, once occurring, would not result in widespread absence of flow along Cienega Creek.*" (FEIS pg. 689-690). Even this scenario is highly uncertain and based the inappropriate use of groundwater modeling assumptions that overestimate the effects of the project on groundwater drawdown given the available data. These assumptions and the resulting overestimated effects on aquatic species have been previously disclosed and analyzed by Rosemont and its consultants. and discussed with the USFS, USFWS, BLM, and EPA. Reference: [1] Levick, L., J. Fonseca, D. Goodrich, M. Hernandez, D. Semmens, J. Stromberg, R. Leidy, M. Scianni, D. P. Guertin, M. Tluczek, and W. Kepner. 2008. The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest. U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 116 pp.
Desert springs, often the sole sources of water for wildlife, support wetland ecosystems including rare and endemic species.[6] Direct and secondary impacts to these seeps and springs because of the Rosemont Mine will adversely affect the aquatic biota dependent on the range of spring-associated water sources. Following mine construction, should springs continue to flow, the wetlands supported by the outflow would be truncated. The amount of area suitable to support wetland species would be greatly reduced and the species least tolerant of drying conditions would be extirpated first and eventually replaced by transition upland species.[7] Sixty-three springs are expected to be lost from direct disturbance or lowering of the groundwater table during construction and operation.[8] [6] Patten, P.T., Rouse, L., and Stromberg, J.C., 2007. Isolated spring wetlands in the Great Basin and Mojave Deserts, USA: potential response of vegetation to groundwater withdrawal. Environmental Management DOI 10.1007/s00267-007-9035-9. 16 pp. [7] Ibid. [8] DEIS, Table 108.	The statement made by EPA is an accurate reflection of the citation as the entire sentence is copied directly from the first paragraph of the abstract; however, it is hard to judge the applicability of the statement as the entire report is a study of the Great Basin and Mojave Deserts, not the Sonoran. The study also appears to have been published in 2008, rather than 2007. Also, the EPA states "*Following mine construction, should springs continue to flow, the wetlands supported by the outflow would be truncated.*" Patten et al (2008) states "flow reduction will truncate the outflow stream, reducing the areal cover of wetland," not that the wetland itself will be truncated. It is also unclear to which wetlands the EPA refers, as the fill activity will directly affect five (5) springs that have no wetlands associated with them. The EPA also uses Patten et al (2008) to support the next statement. However, the EPA makes these assertions without any supporting data. Patten et al (2008) also states "The extent of these effects will vary among springs, based on their distance from extraction sites and location relative to regional groundwater flow paths. On-site monitoring of biotic variables (including cover of selected hygrophytes and phreatophytes) should be a necessary complement to the planned monitoring of local hydrologic conditions." The statement ignores the mitigation required by the Forest Service to replace potentially lost waters by ensure existing stock ponds have a permanent source of water. The reference to the DEIS is correct but ignores the fact that the information was updated in the FEIS. The FEIS details spring effects in Table 114 and summarizes those effects in Table 108. Those losses are limited to five (5) springs directly lost, 71 springs likely to be indirectly impacted (11 highly likely and 60 likely), and 19 springs unlikely to be impacted.
Sanctuaries and refuges are areas designated under state and federal laws or local ordinances to be managed principally for the preservation and use of fish and wildlife resources. Portions of lower Davidson Canyon and Cienega Creek are designated by the State of Arizona as Outstanding National Resource Waters (ONRW) and are within the Cienega Creek Natural Preserve (CCNP), a 4,000 acre sanctuary along 12 stream miles noted for its ecological significance and natural beauty as a desert riparian oasis.[9,10] In addition, portions of Empire Gulch lie within the Las Cienegas National Conservation Area (LCNCA), administered by BLM, a 45,000 acre preserve set aside in large part to protect riparian wetlands and native aquatic organisms including endangered fish and amphibians.[11] [9] Federal regulations for Outstanding National Resource Waters at 40 CFR 131.12(a)(3). [10] http://rfcd.pima.gov/wrd/landmgt/cienegapreserve/ [11] https://www.gpo.gov/fdsys/pkg/PLAW-106publ538/pdf/PLAW-106publ538.pdf	A portion of Davidson Canyon near the confluence with Cienega Creek as well as Cienega Creek itself are designated as Outstanding Arizona Waters; neither is located in a national or state park, a sanctuary or refuge. While a portion of Davidson Canyon is part of the Cienega Creek Nature Preserve (CCNP), a local preserve, and Empire Gulch is part of the LCNCA neither is directly affected by the fill activity and only the former is minimally affected by a loss of stormwater flows. The area in question is approximately 13 miles from the actual fill activity.
The Rosemont Mine will significantly degrade downstream reaches of Davidson Canyon and Cienega Creek. The state designation of Davidson Canyon and Cienega Creek as "Outstanding Arizona Waters"	The state has determined through its 401 Certification process that there will be no impact to water quality. This would include the OAW 12-miles from the site.

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affords them special protection, prohibiting any lowering of water quality. Federal regulations for state-designated ONRWs similarly state, *Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.*[12] [12] 40 CFR 131.12(a)(3).	
The project will also have adverse effects on several human use characteristics of the site and surrounding natural landscapes.[13] A significant secondary adverse effect will result from the construction of the water conveyance pipeline to support mine operations. The pipeline will transport aquifer water to the mine that will cause significant reduction in the quantity of water and possibly the quality of water available for municipal and private water supplies.[14] In addition, the discharge of fill material associated with the mine will destroy and impair resources which support current recreational activities (*e.g.*, wildlife viewing, sightseeing, hiking, camping, hunting) at the mine site and on adjacent natural landscapes. The discharge of fill material will mar the beauty of the natural aquatic ecosystem for the public and property owners by degrading water quality, creating distracting activities, inducing inappropriate development, encouraging incompatible human access, and by destroying vital elements that contribute to constitutional harmony or unity. Finally, discharge of fill material will modify the aesthetic, educational, historical, recreational and scientific qualities of national forest lands and adjacent national and regional wildlife preserves. [13] See Guidelines, Subpart F (40 CFR 230.50-230.54). [14] DEIS, pp. 329-338.	The discussion of the water conveyance pipeline neglects to mention that this area is the Tucson Metropolitan Area. The region chosen for the production wells also supports two mining company operations, wastewater treatment plant discharge, a series of pecan groves, I-19 and other commercial and industrial development. It is also near an existing Central Arizona Project (CAP) recharge site as well as the CAP recharge site that Rosemont has partnered with Community Water Company of Green Valley (CWCGV) to build. The Arizona Department of Water Resources has issued a permit for water use for mineral extraction and metallurgy for the Rosemont Project. The area chosen for production wells was determined to be least impactful to the environment due to the amount of water available in the Tucson Active Management Area (TAMA). DEIS (pg. 245-253) or FEIS (pg. 337) details possible impacts to municipal wells - none show a "significant reduction." Rosemont pumping will be ~2% of the TAMA pumping, though the impact assessment did not include an analysis of the recharge planned by CWCGV. The area used for the fill activity will not be available for recreational activities such as off-road vehicle use, camping, hiking, or shooting; however, once reclamation is complete, low impact uses are anticipated. The post-mining land use has been set to be low impact recreation, wildlife, and cattle. The fill to be permitted is within the National Forest System Lands (NFSL) but is two or more miles away from any national or regional wildlife preserve. The impact will be confined to a fairly small area; the entire 5,421-acre project area constitutes <0.5% of the NFSL in the Coronado National Forest (https://www.fs.usda.gov/land/coronado/landmanagement accessed 11Jan2018).
Discharges of Fill Material into Streams and Springs to Construct the Mine Site Will Cause Unacceptable Adverse Impacts to Wildlife and Wildlife Habitat. [15] [15] See Guidelines, Subpart B (40 CFR 230.11(e)).	The reference (15) cited by EPA is incorrect. This reference specifically refers to aquatic organisms and ecosystems, not wildlife and wildlife habitat.
Destruction of Highly Diverse Assemblages of Animals and Their Habitats. [16] The Rosemont Mine will result in the permanent loss or alteration of 5,431 acres of vegetation and will permanently fill 40.4 acres of waters, including an undisturbed hydrologic network of hundreds of headwater streams spanning over 18 linear miles. The mine will result in the direct loss of 5 springs and 15 stock tanks, with highly likely impacts to an additional 11 springs, and possible indirect impacts to another 60 springs.[17] These streams and associated springs and wetlands provide habitat for hundreds of species of native wildlife that will be either killed or displaced. The discharge of fill material will result in a permanent and irrevocable significant adverse effect to the aquatic ecosystem by altering the substrate elevations and bottom contours of waters; jurisdictional waters will be permanently filled and all ecological functions associated with the jurisdictional substrate will be lost. All immobile, sessile, or inactive organisms dwelling on the substrate at the discharge site will be smothered and killed, or mobile organisms will be forced to migrate to suitable habitat, if available. Immobile organisms will include plants, invertebrates, amphibians, reptiles, ground and nesting birds, and small mammals. Many other typically more mobile organisms will respond to the disturbance associated with land clearing and the discharges of fill material by seeking shelter in borrows or other cover at the disturbance site and will be smothered. The discharge of fill material will result in the loss of breeding and nesting areas, extensive overwintering and resting habitat for resident and migrating birds, escape cover, foraging habitat, critical migration corridors and habitat linkages, and preferred food sources for resident and transient wildlife species associated with the aquatic ecosystem. [16] See Guidelines, Subpart D (40 CFR 230.30-230.32). [17] FEIS, Table 116, p. 583.	As written, EPA's assertion that "*immobile organisms will include...amphibians, reptiles, ground and nesting birds, and small mammals*" is erroneous. Numerous species in these broadly defined groups are highly mobile, and EPA does not indicate which species could reasonably be considered so "immobile" as to be prone to smothering at the discharge site. Similarly, the assertion that "*more mobile organisms will respond to the disturbance...by seeking shelter in burrows or other cover at the disturbance site and will be smothered*" is unsubstantiated and ignores the potential for dispersal to suitable habitat elsewhere. As such, these unsubstantiated statements by the EPA are misleading and clearly overstate the potential effects of the project on animal assemblages.
Many plant and animal species depend on streams, riparian areas and adjacent terrestrial habitats at the mine site for their survival. Many plant and animal species will be directly impacted by the mine through the	The FEIS (pg. 591) uses the same studies cited by EPA in references 18 and 19 so the assumption that the FEIS did not analyze or realize that a diverse species group exists is speculative at best. The FEIS (pg. 649) details the same information listed in reference 20. In

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discharge of fill material into waters or from mine-related construction activities. Except for special status species, much of the information presented in the Final Environmental Impact Statement (FEIS) on species diversity within the mine project area is neither current nor comprehensive. This means that impacts to most plant and animal species at the mine site are underestimated. Vegetation sampling in the project area in the early 1970s recorded 416 plant species and subsequent surveys of similar vegetation communities at the mine site in the northern Santa Rita Mountains during 1986-1987 collected 628 plant species.[18, 19] Based on this information the number of plant species impacted over the entire 5,481-acre site is likely 500-600 species. Russell et al. (1977) identified 138 species of birds known to occur in the project area.[20] A total of 287 bird species have been recorded in the Santa Rita Mountains Important Bird Area (IBI) which encompasses the mine site, including numerous special status species recognized by the Forest Service (USFS).[21] Of note, the proposed project will result in the loss of 3,634 acres within the IBI; a 2.6% loss of IBI habitat.[22] Direct impacts include loss of nesting, overwintering, foraging, roosting, and molt migration habitat for migratory and resident birds. The mine will result in a decrease in food and water availability for some migratory species and loss of nest sites and cover. At least 70 species of migratory birds will be impacted by the mine through direct mortality or the loss of suitable nest, feeding, watering and migratory habitat.[23] At least 50 species of mammals will be directly impacted by the mine. [24] The mine site supports habitat for several large predatory mammals including jaguar, mountain lion, ocelot, bobcat, and black bear; an indication of the sites high quality habitat and unfragmented landscape. Seven amphibian and 46 reptile species are either known or likely to occur within the mine site.[25, 26, 27] [18] McLaughlin, S. and W. Van Asdall, W. 1977. Flora and vegetation of the Rosemont area. In An environmental inventory of the Rosemont area in southern Arizona, vol. 1: The present environment, edited by R. Davis and J.R. Callahan, pp. 64-98. Tucson: University of Arizona. [19] McLaughlin, S., and J.E. Bowers. 1990. A floristic analysis and checklist for the northern Santa Rita mountains, Pima Co., Arizona The Southwestern Naturalist 35(1):61-75. [20] Russell, S.M., Mills, G.S., and Silliman. n.d. [1977]. An inventory of the birds of the Rosemont area. *In*: An Environmental Inventory of the Rosemont Area in Southern Arizona, Vol. 1: The Present Environment, edited by R. Davis and J.R. Callahan. Tucson, AZ: University of Arizona. [21] http://ebird.org/content/ebird/ [22] SWCA. December 2013. Biologists' Report on the Affected Environment and Identification of Species for Disclosure of Effects, Rosemont Copper Mine Project, Pima County, Arizona, Table 13, p. 156. [23] SWCA 2013, Migratory Bird Analysis [24] Roth, E.L. n.d. [1977]. Mammals of the Rosemont Region. *In:* An Environmental Inventory of the Rosemont Area in Southern Arizona, Vol. 1: The Present Environment, edited by R. Davis and J.R. Callahan, pp. 195–217. Tucson, AZ: University of Arizona. [25] FEIS, Chapter 3; SWCA 2013a, b [26] Lowe, C.H. and T.B. Johnson. 1977. Fishes, amphibians, and reptiles of the Rosemont site. In: An Environmental Inventory of the Rosemont Area in Southern Arizona, Vol. 1: The Present Environment, R. Davis and J.R. Callahan, eds. [27] http://eebweb.arizona.edu/collections/Herp/Amphibian.htm Accessed November-December 2015	fact, the FEIS (pg. 571) details the work completed to ensure that species of concern for all cooperators were addressed and evaluated in the process. The Santa Rita Mountains Important Birding Area (IBA) which is identified by the Audubon Society actually lists all of the Santa Rita Mountains. This area includes Madera Canyon which is a world-renown birding area and home to over 230 species of birds (https://www.fs.fed.us/wildflowers/beauty/Sky_Islands/Coronado_NF/SantaRitaMountains/index.shtml, accessed 11Jan2018). The implication that the project site is the specific location for all birds is misleading as the Madera Canyon site will not be impacted by the fill or any other project related activity. Reference 21 does not provide IBA information. The migratory bird analysis by SWCA (reference 23) has different statistics than EPA has cited here. Only 65 species described as "may be impacted," five described as "unknown impact," and none described as "will be impacted" in SWCA report. Reference 24 does not support the statement by EPA and in fact, the Forest Service specifically cited the use of Management Indicator Species to evaluate the overall effect on eight indicator groups in the FEIS (pg. 650). EPA states "The mine site supports habitat for several large predatory mammals including jaguar, mountain lion, ocelot, bobcat, and black bear; an indication of the sites [sic] high quality habitat and unfragmented landscape." There is no citation for this sentence; without further explanation or justification, habitat quality and the extent to which that habitat is fragmented cannot be demonstrated simply on the basis of species that habitat could support. References 25 and 26 do not support this sentence. These lists were created nearly 40 years apart, sometimes before a species had even been identified. Adding them together rather than conducting a comprehensive analysis to create a compiled list is inappropriate and misleading. The link provided for reference 27 does not provide location information regarding species within the proposed project area so the information presented cannot be verified using the information presented. The FEIS focused on 2 amphibians and 6 reptiles (pg. 590).
Collectively, it is reasonable to conclude that the mine will directly impact at least 700-750 plant and animal species by killing and displacing individuals, or altering or destroying their habitats. A large majority of the invertebrate, bird, mammal, reptile and amphibian species that will be directly impacted preferentially use stream, seep, spring and riparian habitats at the mine site, for all or a portion of their life cycles. The great diversity of species within several plant and animal groups that will be directly impacted by the mine is highly significant	The 40.4 acres of fill will impact a limited number of animal and plant species. The facility impacts of areas outside the direct fill were mitigated through the EIS process with the Forest Service and included many of the plant and animal species in this comment. The habitat types that will be affected by the fill are also limited to ephemeral channels and one active spring (with very low flow). Other potential effects are not associated with the fill. The term "highly significant" implies a statistical analysis that has not been performed or supported by the data that is present.
Endangered Species.[28] According to the U.S. Fish and Wildlife Service (FWS) Amended Biological Opinion dated April 28, 2016, construction and operation of the Rosemont Mine will result in significant adverse effects to twelve endangered and threatened species through the permanent modification of habitats and ecological processes upon which they depend for survival; ten of which rely in whole, or in	Direct effects caused by the fill have limited adverse effects, none of the aquatic species listed are adversely affected by the activity being permitted by the Corps. Instead, much of this "effect" is speculation based on a potential drawdown of groundwater 150 years after the close of the mine and is based on a sequence of events that cannot happen, i.e., a conservative approach that involves modeling events that cannot occur simultaneously. Rosemont addresses this issue more fully in a separate report responding to a separate EPA

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significant part, for survival on the aquatic ecosystem (Table 1).[29] This includes corresponding critical habitat for seven of these listed species. [28] See Guidelines, Subpart D (40 CFR 230.30) [29] Amended Final Biological and Conference Opinion for the Rosemont Copper Mine, Pima County, Arizona dated April 28, 2016.	memorandum regarding the potential effects of groundwater drawdown resulting from the Project. Reference 29 is not complete; while there are 12 species that will be adversely affected by the Project, only 6 of those species rely on aquatic ecosystems as part of their life cycle. The last sentence is incorrect as written, there are only six corresponding designated critical habitats; one species has proposed critical habitat (YBCU).
The FWS concluded the mine construction and operation will contribute to effects that will further diminish stream and spring surface flows, pool depths, sizes, and volumes, and reduce water quality, thereby…*resulting in significant degradation of the aquatic ecosystem on which the Gila Chub, Gila topminnow, desert pupfish, Huachuca water umbel, Chiricahua leopard frog, and northern Mexican gartersnake depend… Regardless of the ultimate determinations regarding the effects of the proposed action and its conservation measures on the affected species and critical habitats, the relatively minor mine drawdown-related effects (and mine effects plus the relatively greater climate change effects) in the main stem of Cienega Creek still represent* ***significant degradations*** **[emphasis added]** *of the aquatic ecosystem.*[30] [30] Ibid. Summary of Effects to Aquatic Ecosystem, p. 60	The effects that are itemized are not a result of the fill activities to be permitted by the Corps. Conservation measures for these effects as well as other mitigation efforts for the project have been reviewed by the Forest Service and the FWS during the EIS and section 7 consultation processes and are part of the project record. Reference 30 is correct but the EPA appears to miss the assessment of impact associated with the project - **relatively minor mine drawdown-related effects**. Page 30 of the Amended Final Biological and Conference Opinion for the Rosemont Copper Mine (Amended BO) states: *While the analysis contained in this section is quantitative, it reflects predicted impacts from relatively small amounts of groundwater drawdown, often fractions of a foot, that are occurring decades into the future. The conclusion of groundwater experts consulted by USFS is that such small amounts of drawdown are difficult for any groundwater model to accurately predict. It is important to understand that the detailed predictions contained in this section are meant to inform the decision and to show what could potentially happen if the model predictions were to occur as modeled; however, this does not change the overall uncertainty.* This uncertainty is not indicated in the EPA comments.
Impacts described EPA's Guidelines within Subpart D – Potential Impacts on Biological Characteristics of the Aquatic Ecosystem, including impacts to threatened and endangered species (§ 230.30) should be considered in making factual determinations and findings of compliance with Subpart B – Compliance with the Guidelines. The FWS Amended Biological Opinion findings support a finding under the Guidelines that the proposed mine will result in the significant adverse impairment and destruction of aquatic, wetland and riparian habitats upon which ten threatened and endangered species depend (Table 1). This includes, but is not limited to, significant adverse effects of the mine on elements of the aquatic environment which are particularly crucial to the health and survival of threatened and endangered species such as adequate quantities of good quality water, spawning and maturation (*e.g.,* rearing) and nesting areas, protective cover, adequate and reliable food supply, and resting areas for migratory species (Refer to 40 CFR §230.30(b)(2)).	The reference to 40 CFR 230.30(b)(2) should be fully examined prior to consideration against the statement that the FWS Amended BO determines there is significant degradation. The section (230.30[b]) cited under Threatened and endangered species is a discussion of potential loss of value from the **discharge of dredged or fill material**. The EPA ignores 40 CFR 230.30(c) which states, *"Where consultation with the Secretary of the Interior occurs under Section 7 of the Endangered Species Act, the conclusions of the Secretary concerning the impact(s) of the discharge on threatened and endangered species and their habitat shall be considered final."* None of the determinations made in either Biological Opinion rendered for this project determined that the **discharge** would create a significant adverse effect on endangered species or the aquatic environment.
Table 1. Federally Listed Species and Critical Habitat Significantly Impacted by the Rosemont Mine and their Relationships to Aquatic Habitats	None of the fish species are affected by the fill activity. The frog habitat is affected but there is significant replacement habitat that is required to mitigate for any loss to habitat for the frog. The garter snake habitat is not directly affected and species-specific habitat improvements are required. The water umbel is not directly affected and there is required planting in suitable habitat to extend the possible habitat of this species. Jaguar and ocelot habitat that is affected is specifically in a northern "corridor" that is not occupied by the jaguar. Studies for both species are required around the project to determine actual use. Replacement waters are required so the water supply is not affected. All proposed fencing is wildlife friendly barbed wire therefore the proposed fencing will not restrict movement. The bird species habitat that will be affected is limited on the landscape - no SWFL habitat is impacted and limits on timing for impacts to YBC habitat will minimize impact on the species. The replacement waters will replace actual "water supply" in the short term and the longer-term impacts are mitigated through habitat improvement planning. LLNB habitat is actually protected in this project and no direct impacts will occur from fill activities. PPC will be avoided if possible and if not the plants will be moved - there is minimal impact overall.

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Species	Endangered Species Act Status[1]	Relationship to Aquatic Environment[3]	Will Degradation of Aquatic Habitat Adversely Affect Species?[4]
Gila chub (*Gila intermedia*)	E, CH	All life stages depend on aquatic resources for survival.	Yes
Gila topminnow (*Poeciliopsis occidentalis occidentalis*)	E	All life stages depend on aquatic resources for survival.	Yes
Chiricahua leopard frog (*Lithobates chiricahuensis*)	T, CH	All life stages depend on aquatic resources for survival.	Yes
Desert pupfish (*Cyprinodon macularius*)	E	All life stages depend on aquatic resources for survival.	Yes
Northern Mexican gartersnake (*Thamnophis eques megalops*)	T, CH	Relies on aquatic resources for food and water supply	Yes
Huachuca water umbel (*Lilaeopsis schaffneriana var. recurva*)	E, CH	All life stages depend on aquatic resources for survival.	Yes
Jaguar (Panthera onca)	E, CH	Relies on aquatic resources for food and water supply, wildlife corridor movement	Yes
Ocelot (*Felis pardalis*)	E	Relies on aquatic resources for food and water supply, wildlife corridor movement	Yes
Southwestern willow flycatcher (*Empidonax traillii extimus*)	E, CH	Relies on aquatic resources for breeding, foraging and protective cover	Yes
Western yellow-billed cuckoo (*Coccyzus americanus*)	T, CH2	Relies on aquatic resources for breeding and foraging	Yes
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)	E	N/A	N/A
Pima pineapple cactus (*Coryphantha scheeri var. robustispina*)	E	N/A	N/A

[1]E = Endangered, T = Threatened, CH = Critical Habitat
[2]Critical habitat designation pending
[3]See Guidelines at 40 CFR 230.10(c)(2) and 40 CFR 230.30
[4]In other words, will the proposed activity result in the impairment and destruction of aquatic habitats to which these species are limited? This includes, but is not limited to, significant adverse effects on the elements of the aquatic environment which are particularly crucial to the survival of some threatened and endangered species such as adequate good water quality, spawning and maturation (*e.g.,* rearing) and nesting areas, protective cover, adequate and reliable food supply, and resting areas for migratory species. Refer to 40 CFR 230.30(b)(2).Page 5 of 29

Again determinations by FWS in the biological opinions do not support the contention raised by EPA. Specifically, these are addressed in the 2016 Amended BO in the conclusions section for each species: Gila chub (pgs. 97-98), Gila topminnow (pgs. 116-117), Chiricahua leopard frog (pgs. 157-158), desert pupfish (pgs. 134-136), Northern Mexican gartersnake (pgs. 190-192), Huachuca water umbel (pgs. 220-221), jaguar (pgs. 308-311), ocelot (pg. 329), southwestern willow flycatcher (pgs. 282-284), yellow billed cuckoo (pgs. 255-257), lesser long-nosed bat (pgs. 351-352) and the Pima pineapple cactus (pg. 369).

Bird Overwintering Areas. [31] The Rosemont Mine site contains critically important grassland, woodland, stream, wetland and riparian habitats that support populations of many species of overwintering birds and thus constitutes a "key wintering area."[32] Riparian woodlands in the Southwest Avifaunal Biome (which encompasses the project site), including those adjacent to non-perennial waters, support the highest diversity of land bird species and the highest vulnerability to population declines in the United States.[33] The findings of Rich *et al*. (2004) and Berlanga *et al.* (2010) are consistent with the research of other scientists with respect to biological diversity of breeding and overwintering migratory birds; the critical significance of semi-desert grasslands, oak woodlands, and xeroriparian or ephemeral wash areas during winter to the health and survival of migratory and resident birds.[34,35]	Reference 31, Subpart C (40 CFR 230.22) refers to water and its relationship with aquatic organisms, and does not directly reference wildlife, birds, or bird habitat. The discussion of the Rosemont site overstates the resources available. While there are grasslands and woodlands within the site, and xeroriparian habitat, the streams are part of an ephemeral system and there are no wetlands within the project area. The reference cited (32) actually discusses additional information that has been left out of the EPA statement "*The analysis area (as with nearly all of southeastern Arizona) provides important overwintering habitat for a variety of bird species,* ***as does nearly all of southeastern Arizona*** *[emphasis added].*" (pg. 48, SWCA 2013, Migratory Bird Analysis). This is an important point when reviewing potential impacts associated with the fill activity.

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[31] See Guidelines, Subpart C (40 CFR 230.22) and Subpart D (40 CFR 230.32) [32] SWCA 2013, Migratory Bird Analysis [33] Rich, T.D., Beardmore, C.J., Berlanga, H., Blancher, P.J., Bradstreet, M.S.W., Butcher, G.S., Demarest, D.W., Dunn, E.H., Hunter, W.C., Iñigo-Elias, E.E., Kennedy, J.A., Martell, A.M., Panjabi, A.O., Pashley, D.N., Rosenberg, K.V., Rustay, C.M., Wendt, J.S., and Will. T.C. 2004. Partners in Flight North American Landbird Conservation Plan. Ithaca, New York: Cornell Lab of Ornithology. [34] Ibid. [35] Berlanga, H., Kennedy, J.A., Rich, T.D., Arizmendi, M.C., Beardmore, C.J., Blancher, P.J., Butcher, G.S., Couturier, A.R., Dayer, A.A., Demarest, D.W., Easton, W.E., Gustafson, M., Iñigo-Elias, E., Krebs, E.A., Panjabi, A.O., Rodriguez Contreras, V., Rosenberg, K.V., Ruth, J.M., Santana Castellón, E., Vidal, R.M., and Will. T. 2010. Saving Our Shared Birds: Partners in Flight Tri-National Vision for Landbird Conservation. Ithaca, New York: Cornell Lab or Ornithology	It is important to note that reference 35, Berlanga et al (2010), indicates that grasslands, Mexican pine-woodlands, and arid lands contain moderate to small percentages of species with high risks for extinction, compared to other habitats. Those habitats are not specifically found at the Rosemont site. Further, references 34 and 35 cannot be determined to be accurate, as the context of the sentence is that their claims are supported by the research of other scientists, but examples of that research are not provided.
Of significance and per SWCA (2013):[36] *At the more local level, in the vicinity of the proposed* [Rosemont Mine] *project, Russell et al. (n.d. [1977]) recorded 45 overwintering bird species on their four transects, conducted between January 26 and February 10, 1976, when migratory movements were expected to be lowest; this is therefore a conservative estimate of the number of species that may use the habitats outside this narrow window. Other species were opportunistically observed outside of the survey transects. Nevertheless, their results confirm a high diversity of overwintering species, including short-range migratory species, long-range migratory species, and resident species. Overwintering bird species that occur in the Rosemont area (Russell et al. n.d. [1977]) include (but are not limited to) at least 5 raptors (not including the golden eagle, observed in winter 2009 [see the "Bald and Golden Eagles" section in this document]), 4 woodpeckers, 3 corvids, 3 wrens, and at least 12 species of sparrows. The most-detected species during their winter transects included mourning dove (Zenaida macroura), Mexican jay, Bewick's wren, ruby-crowned kinglet (Regulus calendula), house finch (Carpodacus mexicanus), canyon (or brown) towhee, rufous-crowned sparrow (Aimophila ruficeps), black-throated sparrow, Brewer's sparrow (Spizella breweri), dark-eyed junco (Junco hyemalis), and huge numbers of chipping sparrows (Spizella passerina). Some of the short-distance migrants that wintered in the adjacent valleys but were present during breeding season in the Rosemont area include Cassin's sparrow, lark sparrow, Botteri's sparrow, northern cardinal (Cardinalis cardinalis), and pyrrhuloxia (Cardinalis sinuatus). Additionally, approximately 180 species of birds have been documented within the Santa Rita Mountains Important Bird Area* [which encompasses the mine site] *during the months of December, January, and February from 1900 to 2013 (eBird 2013b).* . [36]Ibid. SWCA 2013. p. 50	This information occurs in the FEIS (pg. 650) and was included in the Forest Service analysis.
Specifically, there will be 5,431 acres of direct impacts to natural vegetation types from the Rosemont Mine, including direct habitat impacts to 585 acres of riparian, 2,557 acres of grassland, and 2,690 acres of Madrean evergreen scrub.[37] The Madrean pine-oak woodlands ecoregion is an internationally recognized biodiversity hotspot featuring significant levels of biodiversity that is under threat from humans.[38] Although the most biologically diverse wintering ground for short-and long-range bird migrants in the United States, southeastern Arizona is threatened by habitat fragmentation and degradation. The Rosemont Mine's direct disturbance of over 5,000 acres would contribute to significant degradation in habitat quality and quantity for overwintering birds within the mine site and southeastern Arizona. Additionally, since grass cover and grass-seed production are important in both habitat selection and overwinter survival of southwestern grassland birds, any disturbance of large expanses of grasslands at the mine would be expected to have negative impacts on any migratory bird species that would winter in the area, including birds moving between habitat types (*e.g.,* between ephemeral wash/xeroriparian and grassland habitats).[39] A direct	The areas as quoted are incorrect and appear to mix the columns in Table 122 from the FEIS (below). Also in the FEIS (pg. 493-495) is the evaluation and explanation regarding the riparian mapping. Pima County mapping was used however when compared to onsite surveys, .it overestimated riparian resources 86 percent of the time in 43 riparian area widths. There were also discrepancies in the overall species types that were noted.

<table>
<tr><th>EPA Comment</th><th>Rosemont Response</th></tr>
<tr><td>consequence of construction of the Rosemont Mine will be a significant reduction in the carrying capacity of riparian and other associated habitat types at the mine site for overwintering and resident birds. The mine will fill over 18 linear miles of ephemeral stream and associated xero-, meso-and hydro-riparian habitat causing significant degradation of the aquatic ecosystem used as a preferred food source and resting area by resident and overwintering birds.[40] The discharge of fill material will lower overwintering bird abundance and diversity and disrupt normal functions of the aquatic ecosystem leading to significant reductions in overall biological diversity.

[37]FEIS, Table 122, p. 666.
[38] Myers, N., Mittermeier, R.A., Mittermeier, C.G., Gustavo, A., da Fonseca, B., and J. Kent. 2000. Biodiversity hotspots for conservation priorities. Nature 403: 853-858.
[39]Bock, C.E., Bock, J.H. 1998. Response of winter birds to drought and short-duration grazing in southeastern Arizona. Conservation Biology 13(5):1117-1123.
[40] See Guidelines, Subpart D (40 CFR 230.22).</td><td>Table 122. Direct impacts to vegetation type (acres lost or altered) resulting from each action alternative and connected actions
<table><tr><th>Vegetation Type</th><th>Proposed Action</th><th>Phased Tailings</th><th>Barrel</th><th>Barrel Trail</th><th>Scholefield-McCleary</th></tr><tr><td>Upland</td><td>4,931</td><td>4,836</td><td>4,846</td><td>5,258</td><td>5,569</td></tr><tr><td>Semidesert grassland</td><td>2,217</td><td>2,242</td><td>2,312</td><td>2,557</td><td>3,004</td></tr><tr><td>Madrean evergreen woodland</td><td>2,702</td><td>2,583</td><td>2,523</td><td>2,690</td><td>2,553</td></tr><tr><td>Chihuahuan desertscrub</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Sonoran desertscrub</td><td>11</td><td>11</td><td>11</td><td>11</td><td>11</td></tr><tr><td>Riparian</td><td>682</td><td>645</td><td>585</td><td>630</td><td>628</td></tr><tr><td>Hydroriparian</td><td>193</td><td>190</td><td>113</td><td>120</td><td>155</td></tr><tr><td>Xeroriparian A</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0*</td></tr><tr><td>Xeroriparian B</td><td>435</td><td>402</td><td>419</td><td>457</td><td>420</td></tr><tr><td>Xeroriparian C</td><td>53</td><td>53</td><td>53</td><td>53</td><td>53</td></tr><tr><td>Xeroriparian D</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Total</td><td>5,612</td><td>5,481</td><td>5,431</td><td>5,888</td><td>6,197</td></tr></table>Note: Because of rounding, the total may not equal the sum of the individual numbers.
* Less than 1 acre would be directly impacted.

The claim that the “Madrean pine-oak woodlands ecoregion is an internationally recognized biodiversity hotspot” is unsubstantiated. Additionally, the paper cited in footnote 38 provides no evidence in support of this claim, and indeed does not even mention Madrean pine-oak woodlands. Similarly, the assertion that southeastern Arizona is “the most biologically diverse wintering ground for short-and long-range bird migrants” stands unsupported, as does the assertion that “The discharge of fill material will lower overwintering bird abundance and diversity and disrupt normal functions of the aquatic ecosystem leading to significant reductions in overall biological diversity”. Reference 40 is a specific discussion regarding water and not riparian or wildlife habitat.

The use of reference 39 in this context is misleading. The article referenced by the EPA is a study of the effects of grazing and drought on the presence of grassland and other avian species at one location in southern Arizona; the study does not provide or claim to provide data to support a conclusion that disturbance associated from activities such as the project will lead to a significant reduction in the carrying capacity of the area for birds. Moreover, the authors admit that their study has a limited scope of inference because it “represent[s] data at one unreplicated point in space and time” (Bock and Bock 1999, pg. 1122). Moreover, the article explicitly discusses prior studies of similar grazing effects on grassland birds that found no significant difference of grazing treatments on birds (Bock and Bock 1999, pg. 1122). The EPA does not acknowledge these clear limitations and the competing results of Bock and Bock studies that are discussed in reference 39. Rather, the EPA inappropriately attempts to use the reference to support the unsubstantiated claim that the project will have significant effects on populations of grassland birds. Research on grassland birds clearly indicate that grassland bird species overwinter in a much larger area than the mine site, or the vicinity of the project (e.g., see figures 1 and 2 of Panjabi, Arvind, Erin Youngberg and Gregory Levandoski, 2010). As such, statements by the EPA regarding the “significant reduction in carrying capacity at the mine site” have little biological meaning to the population dynamics of grassland bird species and are highly misleading; the mine site is an exceedingly small portion of the overwintering range of grassland bird species.</td></tr>
<tr><td>Fragmentation of Critical Animal Migration Corridors. [41] The Santa Rita Mountains provide several critical regional animal movement corridors or wildlife linkages. [42] The natural topography of the mine site will be irreversibly changed by the re-contouring of the site and the filling of the extensive stream network. The mine will result in significant fragmentation of six animal movement corridors and this will significantly disrupt animal dispersal and migration patterns for many species currently using these corridors.[43] Within the six impacted corridors, a total of 1,626 acres of habitat will be directly impacted, including the permanent filling of jurisdictional waters comprising the stream network at the mine site.[44] Thus, the discharge of fill material will result in the loss of corridors critical to animal movement and migration for numerous resident and transient wildlife species. The fragmentation of animal migration corridors has the potential to adversely disrupt populations of animals utilizing adjacent mountain ranges through restrictions to their natural dispersal routes.</td><td>EPA fails to define what constitutes “significant” fragmentation of animal movement corridors here. Per FEIS Table 129, the total direct impacts to these corridors range from 0.001% to 4.1%; it is misleading without specific evidence to simply state that these impacts could reasonably be considered “significant”. Similarly, given the data presented in Table 129, EPA’s claim that the discharge of fill material to 40 acres of Waters will cause the “loss” of animal movement corridors is dramatically overstated and wholly unsupported.</td></tr>
</table>

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[41] See Guidelines, Subpart D (40 CFR 230.32). [42] FEIS, Table 118, Figure 76 [43] FEIS, Table 129. [44] Ibid.	**Table 129. Direct impacts (lost or modified) by the Barrel Alternative to animal movement corridors within the analysis area**

Animal Movement Corridor Name	Direct Permanent Movement Habitat Loss due to Construction and Mining Activities within Security Fence (Acres)	Direct Permanent Movement Habitat Loss due to Construction of Primary Access Road and Other Roads (Acres)	Direct Short-term Movement Habitat Loss due to Utility Corridor Impact (Acres)	Direct Permanent Movement Habitat Loss due to Construction of Arizona National Scenic Trail (Acres)	Total (Acres) and Percent of Direct Corridor Impact in Analysis Area (and of Total Corridor) due to Barrel Alternative
Linkage 92, San Xavier-Sierrita-Santa Rita Linkage	436	0	868	0	1,304 and 20.7% (0.7%)
Linkage 95, San Rita-Empire Complex Linkage	762	89	0	14	865 and 7.2% (4.1%)
Landscape Movement Area 31: Santa Cruz River to Santa Rita Experimental Range	0	0	16	0	16 and 100% (0.4%)
Riparian Movement Area 22: Lee Moore Wash Flow Corridors	0	0	64	0	64 and 7.6% (0.2%)
Riparian Movement Area 25: Empire Gulch/Oak Tree Canyon	347	0	0	8	355 and 3.2% (3.2%)
Linkage 94, Rincon-Santa Rita-Whetstone Linkage	0	0	0	1	1 and 0.003% (0.001%)

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	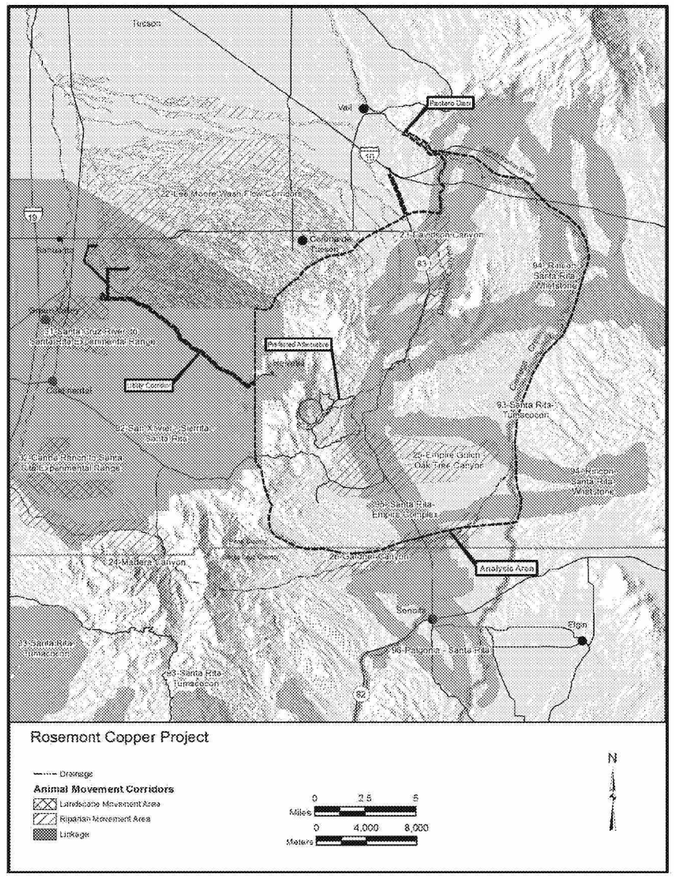 **Figure 76. Wildlife linkages relative to the analysis area (Arizona Game and Fish Department 2012e; Beier et al. 2008; Beier et al. 2006a; The Arizona Wildlife Linkages Workgroup 2006)** Impacts to corridor 95 that include the access road and a portion of the operation appear to be overstated due to the inclusion of SR83 in that corridor. Further, impacts to corridor 92 are temporal and limited - the extension of the corridor specifically to a mining area appears to have been ill considered in the first place.
Reduction in Streamflow Will Cause Unacceptable Adverse Impacts to Waters in Barrel and Davidson Canyons and Lower Cienega Creek. [45] [45] See Guidelines, Subpart B (40 CFR 230.11 (b)).	
Ephemeral and intermittent streams in arid environments perform the same critical hydrologic functions as perennial streams in wetter environments by moving water, sediment and debris through the stream network and providing connectivity within the watershed.[46] Streams in semi-arid regions are complex systems due to wide fluctuations in the distribution, amount and timing of precipitation. This hydrologic variability is reflected in the storm flow data for Barrel and Davidson canyons. Surface flow monitoring stations in Barrel and Davidson canyons provide detail on the current frequency, magnitude, duration and	EPA indicates that streamflow data measured and documented by Rosemont show: "*For 2013-2014, Barrel Canyon* ***contributed much greater total flow volume*** *(as measured immediately downstream from the confluence of Davidson and Barrel canyons) than Davidson Canyon upstream of their confluence."* This statement is misleading and based on simplistic analysis of two years of data. EPA discusses the comparison of measured flow volumes from sub-basins of Davidson Canyon watershed using data from the Barrel and Davidson gages. The stream gage locations (due to land ownership) do not measure the distribution of flow at the Barrel-Davidson

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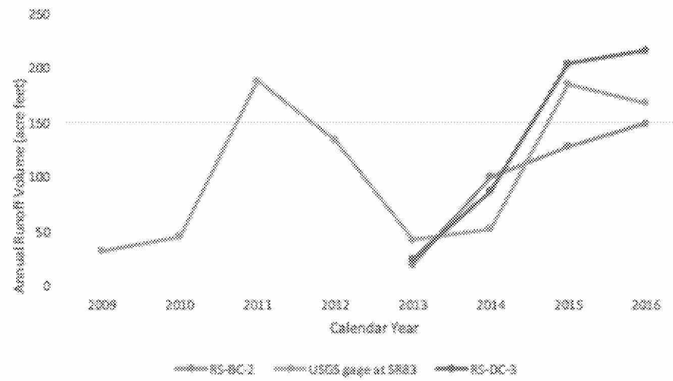
volume of flows.[47] During 2013, Barrel Canyon experienced a total of 23 days of storm flow, while Davidson Canyon had a total of 2 days of stormflow. In 2014, stormflow was 47 days for Barrel and 8 days for Davidson, respectively. Peak summer stormflows in 2014 in Barrel and Davidson canyons measured nearly 300 and 500 cfs, respectively, an indication that even relatively small washes in mountainous areas can generate very high discharges over short periods of time. For 2013-2014, Barrel Canyon contributed much greater total flow volume (as measured immediately downstream from the confluence of Davidson and Barrel canyons) than Davidson Canyon upstream of their confluence;[48] another indication of the significance of surface flow contributions from Barrel Canyon at the mine site to Davidson Canyon. That Barrel Canyon provides a disproportionally high amount of surface water within the Davidson Canyon watershed relative to its drainage area is because Barrel Canyon drains most of the higher elevations of the watershed where the orographic effect produces greater precipitation and runoff.[49, 50] [46] Levick, L. D., Fonseca, J., Goodrich, D., Hernandez, M, Semmens, D., Stromberg, J., Leidy, R., Apodaca, M., Guertin, D.P., Tluczek, M., Kepner, W., 2008. The ecological and hydrological significance of ephemeral and intermittent streams in the arid and semi-arid American southwest. U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 116 pp. [47] Letter to USFS from Hudbay dated January 22, 2015. Attachment: Water and Earth Technologies (January 6, 2014). Analysis of Barrel Canyon and Davidson Canyon Instrumentation Data December 1, 2013-December 31, 2013. Prepared for the Rosemont Copper Company. [48] Ibid. [49] Powell, B., Fonseca, J. and F. Postillion. 2015. New analysis of stormflow and groundwater data from Davidson Canyon: evidence for influence of stormwater recharge of groundwater. Memorandum prepared by and for the Pima County Office of Sustainability and Conservation and Pima County Regional Flood Control District. December 13, 2015. 9 pp. [50] Letter to Colonel D. P. Helmlinger, Commander, South Pacific Division, Corps of Engineers and Alexis Strauss, Acting Regional Administrator, EPA, Region 9, from C.H. Huckelberry, Pima County Administrator, RE: *Rosemont Copper Mine, Section 404 Clean Water Act*, dates June 6, 2017.	confluence as indicated. The Rosemont Davidson gage is approximately 2.5 miles downstream of the confluence of Barrel with Davidson Canyon. The Rosemont Barrel gage is approximately 1.75 miles upstream of the confluence with Davidson Canyon. The two years of data described by EPA do not show that Barrel Canyon contributed a *much greater* contribution of volume, but rather demonstrate very similar total runoff for the two gages and year-to-year variability that commonly occurs in the Davidson watershed. Figure 1 shows the total runoff volumes computed from data at the Rosemont Barrel gage (RS-BC-2), the USGS gage at the SR 83 bridge (USGS 09484580 BARREL CANYON NEAR SONOITA, AZ) and Rosemont Davidson Canyon gage (RS-DC-3). This data record shows that the total volume of flow measured at the Barrel Canyon gages are generally less than measured at the Davidson gage, but year-to-year variations also occur. EPA acknowledges this variability, "*Streams in semi-arid regions are complex systems due to wide fluctuations in the distribution, amount and timing of precipitation. This hydrologic variability is reflected in the storm flow data for Barrel and Davidson canyons.*" The majority of storm runoff events in Davidson Canyon are produced during the summer monsoon season where there is great spatial and temporal distribution of precipitation during thunderstorms that move across the Davidson Canyon watershed. During monsoon season, runoff in washes is produced by locally heavy thunderstorm activity. Flow measurements have described storm runoff occurring in Barrel Canyon when no runoff has occurred during the same time downstream in Davidson and vice versa, Davidson Canyon has had observed runoff while Barrel Canyon had none. As shown in the measured data (Figure 1), the total annual contribution of runoff from portions of the Davidson Canyon watershed is not always directly proportional to watershed area. Figure 1. Comparison of Measured Total Annual Runoff Volumes at Three Stream Gages in Davidson Canyon.  The EPA has attempted to represent a small, two-year data set as a comprehensive relationship. This oversimplification has also been observed in the references the EPA has cited in their Letter. The EPA cites a letter by Powell et al. (2015). Rosemont responded to the Powell et al. (2015) letter with Rosemont (2016). Rosemont (2016) indicated, "*Powell et al. (2015) entirely overlooks the spatial and temporal variation of rainfall in drawing conclusions about its relationship with surface water volumes at different locations within the 32,320-acre watershed.*" An analysis of rainfall data throughout Davidson Canyon was presented that illustrates this oversimplification. Reference 48 does not validate the statement it references. The Davidson Canyon flows (when measured) are twice that of Barrel, indicating at most an even distribution of flows (i.e. 9/20/13 - 158.66 vs. 325.83 cfs, 7/9/14 - 3.64 vs. 14.51, 8/1/14 - 298.42 vs. 494.71, 9/8/14 - 5.37 vs. 0.33 and 9/20/14 - 58.22 vs. 457.48) on Barrel and Upper Davidson or an illustration of the isolated nature of monsoon storm events.
All stream channels in the Davidson Canyon watershed are variously connected by surface and shallow	The discussion included in the Integrated Watershed Summary includes both a general discussion as well as an understanding of

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subsurface hydrologic pathways to downstream waters.[51] Runoff generated by greater amounts of precipitation falling over higher-elevation headwater streams at the mine site concentrates as stormflow and as these stormflows travel downstream some water is lost as recharge to the shallow alluvial aquifer. Barrel Canyon contributes surface and shallow alluvial water to Davidson Canyon and lower Cienega Creek. The additive contribution of stormwater and shallow subsurface flows from Barrel Canyon increases the total amount of storm and alluvial water available to downstream reaches of Davidson Canyon and lower Cienega Creek, including ONRW reaches. [51] Rosemont Copper Integrated Watershed Summary June 2012. Rosemont clearly acknowledges that precipitation falling at higher elevations of the mine site results in aquifer recharge and flows by deep, shallow and alluvial stream channel pathways into Barrel and Davidson canyons and lower Cienega Creek resulting in groundwater discharging to the surface as baseflow. EPA rejects the conclusions in the FEIS arguing that stormwater flows originating in the higher-precipitation areas of the mine site (representing 13% of the total Davidson Canyon watershed) are somehow entirely hydrologically isolated from, or provide insignificant contributions to, the downstream ONRWs in Davidson Canyon and lower Cienega Creek. Such speculation ignores our current scientific understanding of how water moves through surface and sub-surface pathways along hydrologic gradients in the Cienega Creek watershed (See Letter from C.L. Huckelberry, Pima County Administrator, to William James, U.S. Army Corps of Engineers and Kerwin Dewberry, Forest Supervisor, Coronado National Forest, regarding *New Information: Rosemont Copper Mine, Section 404 Clean Water Act*, dated September 28, 2017). The scientific literature supports our understanding that for arid regions such as the Cienega Creek watershed, water originating as surface or stormflow in the wetter headwaters can infiltrate into the alluvial stream channel and reappear at great distances downstream as stream surface flow/baseflow (*e.g.,* Levick *et al.* 2008).	possible recharge in the basin. The statement and subsequent footnote make assertions and show a degree of disagreement on the understanding of the system that includes the Barrel Canyon. Subsequent study over the past five years that includes rain gage and flow information at the site not available in 2012 do not support that the areas at the Project site are "higher precipitation areas." The general comment about the orographic effects of precipitation has been addressed in the Final Environmental Impact Statement (FEIS). The EPA Letter alludes to the idea that this effect only occurs within the Barrel Canyon portion of Davidson Canyon. Other headwater sub-watersheds of Davidson also contribute to flow near the OAW. As acknowledged in the FEIS volume 2 page 430, "*Cooperating agencies have commented that these estimated reductions in flow to Davidson Canyon may be underestimated because the mine site is located at the head of the watershed at a higher elevation and because due to orographic effects on precipitation, the relative contribution of water to the watershed is greater from these areas. This effect is acknowledged as being likely. However, Barrel Canyon is only one drainage that arises off of the Santa Rita Mountains and supplies Davidson Canyon. McCleary Canyon, Scholefield Canyon, Papago Canyon, and Mulberry Canyon also would experience similar orographic effects and (depending on the alternative) would still supply water to Davidson Canyon. The east side of Davidson Canyon receives drainage from the Empire Mountains. Although these are not as high in elevation as the Santa Rita Mountains (rising to an approximate elevation of about 5,000 feet above mean sea level rather than 6,000 feet above mean sea level), they would likely still have an orographic effect. While it is acknowledged that Barrel Canyon receives higher precipitation due to its location, it is by no means the only part of the Davidson Canyon watershed that does, and the estimates provided are still valid approximations, albeit with some uncertainty.*"
Sub-flow that originates from stormflows in Barrel and Davidson canyons follows a hydraulic gradient downstream as water perched above bedrock overlain by shallow alluvium. The shallow groundwater aquifer of Davidson canyon is highly responsive to pulses of baseflow or stormflow.[52] As shallow groundwater levels rise and fall so does the length of flow in Davidson Canyon increase and decrease.[53] Stormwater-generated shallow alluvial water eventually reappears within Davidson Canyon and lower Cienega Creek ONRWs supporting low-surface flow, which is especially important to sustaining aquatic organisms and their habitats during the drier portions of the year.[54] Low-surface flow is critical to maintaining riffles and pools and wetlands; Special Aquatic Sites used by a variety of sensitive plant and animal species in Davidson Canyon and lower Cienega Creek.[55] [52] Ibid. Powell, B., Fonseca, J., and F. Postillion. 2015. [53] Ibid. [54] Pima Association of Governments. 2003. Contribution of Davidson Canyon to Base Flows in Cienega Creek, 40pp. [55] Powell, B.L., Orchard, L., Fonseca, J. and Postillion, F. 2014. Impacts of the Rosemont Mine on hydrology and threatened and endangered species of the Cienega Natural Preserve. Pima County, AZ.	The EPA discusses the concept of hydrologic flow paths from Davidson Canyon watershed headwaters to downstream watershed areas near the OAW. The EPA Letter also indicates, "*EPA rejects the conclusions in the FEIS arguing that stormwater flows originating in the higher-precipitation areas of the mine site (representing 13% of the total Davidson Canyon watershed) are somehow entirely hydrologically isolated from, or provide insignificant contributions to, the downstream ONRWs in Davidson Canyon and lower Cienega Creek.*" Hydrologic flow paths are described conceptually in Integrated Watershed Summary (IWS) page 20. Specifically, sources of stream flow in Davidson Canyon are discussed on IWS page 24, "*In Davidson Canyon, all stream flow appears to be the result of stormwater runoff; shallow groundwater flow in the alluvial channel is due to stormwater infiltration.*" For impact assessment, the hydrologic flow paths are modeled in the regional groundwater model as recharge through alluvial stream channels throughout the watershed and groundwater withdrawal at specific seep and spring locations in downstream channels. IWS page 107, "*Recharge in alluvial stormwater drainage channels was not explicitly simulated, but is accounted for in the simulated recharge for the entire basin.*" Impact of the Project on seeps and spring water sources near the OAW are described in the IWS page 130, "*A qualitative evaluation of the effects of groundwater withdrawal on aquatic resources suggests that resources far from the proposed mine, such as Cienega Creek and lower Davidson Canyon, will experience relatively small magnitudes of groundwater drawdown that will not occur for centuries.*" The reference (55) cited doesn't appear to fully support the broad language used by EPA here. Powell et al. 2014 includes the following language: " *The drawdown of the aquifer that supports critical base flows for this species will likely reduce the size and volume of the pools in which the Gila chub live*". This is consistent with the general thrust of EPA's language, but is specific to Gila chub. Notably, the cited document does not mention Special Aquatic Sites, nor does it specifically address the maintenance of riffles, pools and wetlands.
Effects of Rosemont Mine on Storm Flows. The Rosemont Mine will result in alteration of the natural surface hydrology through the direct fill of waters, the loss of contributing watershed area, and the modification of natural flow from the construction of in-channel stormwater basins and diversions designed to retain, slow or convey storm water around mine areas. During the active 20-25 years of mining at the site, the proposed project will reduce stormwater runoff from the project area by greater than 30-40%, reducing surface flow at the Davidson Canyon/Cienega Creek confluence by a minimum of 7.6 – 10.2%.[56, 57, 58] [56] Email from Chris Garrett, SWCA to Robert Leidy, EPA dated September 15, 2015. We believe the	Reference 56 simply says that the 30-40% reduction in flow during operations can be extrapolated, which can be used to support the information presented. The second sentence of the reference is itself an assertion by EPA that is not supported by the record. Based on actual stormwater measurements at the site, (see response to EPA HMMP comments) Rosemont believes the rainfall amount of 18 inches is an appropriate measure when averaged over the entire site. Reference 57, Pima County does provide the concern regarding precipitation values. However, the EPA statement "We believe…" is again an assertion by EPA with no foundation as a citation. In fact, as noted in the HMMP completed for the Project, and bolstered by additional analysis in Rosemont's response to EPA's comments on the HMMP (provided under separate cover), the estimate of

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reduction in surface flow is underestimated. [57] The FEIS likely significantly underestimates the reduction in stormwater discharge from the mine because their modeling uses inappropriate precipitation values. We believe that this results in a significant underestimation of the estimated reduction in stormwater runoff from the project area. Refer to comments in a letter from Pima County to ADEQ, dated April 4, 2014. [58] Letter from C.H. Huckelberry, Pima County Administrator, to Rosi Sherrill, ADEQ, regarding *2017 Addendum to Water Quality Permit, Rosemont Copper Project ACOE Application No. SPL – 2008-00816-MB*.	stormwater flows in the FEIS is significantly *overstated*. The proposed mitigation will more than offset any potential reduction in downstream flows.
The Pima Association of Governments (PAG) has conducted 20 years of hydrologic monitoring along Cienega Creek, including documentation of the relative contribution of surface and shallow subsurface flows from Davidson Canyon Wash to base flows in Cienega Creek.[59] Davidson Canyon Wash, an intermittent stream upstream of its confluence with Cienega Creek, contributes significant flood flows to Cienega Creek. Through analysis of water chemistry and stable isotopes, PAG found that between 8 and 24% of perennial flows during the lowest flow period in Cienega Creek are attributable to Davidson Canyon Wash's underflow contributions. Any decreases in the surface flows of Barrel Canyon and Davidson Canyon resulting from the mine will significantly reduce the contribution of water that sustains the low-water surface flows of Davidson Canyon and lower Cienega Creek OAWs.[60, 61, 62] Even seeming small statistical changes in low-water surface flows of a few percent will cause or contribute to significant degradation of the aquatic ecosystem through loss of aquatic habitat and declines in water quality in Davidson Canyon and lower Cienega Creek, especially during the June when stream flows are at their lowest levels. [59] Ibid. Pima Association of Governments 2003 [60] Rosemont Copper acknowledges that the surface recharge supporting low-water surface flows along the length of Davidson Canyon would be reduced by the mine and this would reduce surface flow in Cienega Creek. Rosemont Copper estimates that the surface recharge supporting low-water surface flows along the length of Davidson Canyon would be reduced by the mine by approximately 10% and this would reduce low-water surface flows in Cienega Creek by 0.8 and 2.3%. Integrated Watershed Summary. June 2012. Rosemont Copper. [61] The FEIS recognizes the hydrologic connectivity between surface flow and sub-flow and further acknowledges that the predicted reduction in surface flow could result in a reduction in recharge to the shallow alluvial aquifer and sub-flow supporting low-water surface from Davidson Canyon into Cienega Creek (p. 554). [62] Ibid. Powell, B., Fonseca, J., and F. Postillion. 2015.	The EPA indicates, "***Any decreases*** *in the surface flows of Barrel Canyon and Davidson Canyon resulting from the mine* ***will significantly reduce*** *the contribution of water that sustains the low-water surface flows of Davidson Canyon and lower Cienega Creek OAWs*." The FEIS presents the magnitude of flow reductions expected at the mouth of Davidson Canyon. The Integrated Water Summary (IWS) describes these expected small annual average reductions in the context of natural variability. IWS end of section 5.5.2 (pg. 98), "*The predicted hydrologic changes using average-annual values can help estimate the magnitude of the Project's impact over time. However, because of the large variability in annual runoff that occurs naturally within the semi-arid regions of southern Arizona, it will be impossible to attribute any observed direct or indirect change in runoff in Davidson Canyon due to the Project without additional data. In fact, due to the large variability in the temporal and spatial distributions of storm systems that occur in the region, significant runoff events will still occur from those portions of the Davidson Canyon watershed that are not impacted by the Project. Similar calculations were performed below the Davidson Canyon-Cienega Creek confluence (Tetra Tech, 2011). However, as you move further from the Project, the watershed area increases, and the impacts associated with the Project on these areas becomes smaller approaching the natural variability associated with ephemeral systems.*" Reference 59 supports the claim that PAG has studied the relative contributions of flows from Davidson Canyon to Cienega Creek, but does not support the claim that PAG has conducted 20 years of hydrologic monitoring. Reference 61, FEIS (pg. 554) actually states that the reduction in flow could represent a reduction and further discusses the uncertainty. In its entirety the statement is, "*The reduction in surface flow itself would likely have no impact to riparian vegetation or water quality; it could represent a reduction in recharge to the shallow alluvial aquifer and subflow from Davidson Canyon to Cienega Creek. The distance downstream of the project area (12 miles) that flows have to travel before reaching lower Davidson Canyon gives the predicted effect a high level of uncertainty, as recharge in lower Davidson Canyon is more likely to occur either from very large storm events or from more localized runoff events.*" In addition, as noted elsewhere, Rosemont's proposal to remove four selected stock tanks at the Project site, as described in the HMMP, will effectively offset any potential reductions in downstream flows.
Several recent reports by Pima County clearly establishes the strong positive relationship between the amount of surface water flow and shallow subsurface flow in Davidson Canyon and Cienega Creek.[63] These Pima County studies conclude that any reductions in groundwater, which includes shallow subsurface alluvial groundwater originating from stormflows, from the mine will significantly reduce low-water surface flows, and that as low-water surface flows decrease the reach and extent of surface flow will decrease and fragmentation of remaining pools will increase in Davidson Canyon and lower Cienega Creek ONRWs. Smaller, shallower and more fragmented pools in Davidson Canyon and lower Cienega Creek will significantly reduce the extent of surface water and habitat critical for the survival for aquatic organisms, including Gila Chub.[64] The presence of three fish and one frog (*i.e.*, Gila chub, Gila topminnow, longfin dace) three of which are listed as endangered by the FWS, have been recently documented from pools at the confluence of Davidson Canyon and Cienega Creek.[65, 66] Decreases in low-water flow in lower Cienega Creek will result in increased water temperatures.[67, 68] Relatively small increases in water temperature in remaining pools in lower Cienega Creek will cause or contribute to significant reductions in the amount and quality of suitable habitat for fish and other aquatic organisms, including riparian wetlands.[69]	While Pima County reports appear to establish a relationship between surface water and subsurface flows in Davidson Canyon and Cienega Creek. The connection between those locations, the Rosemont site 12 miles upstream, and the potential effects of a stormwater reduction are unclear so the statements made by EPA become tenuous. In fact, as stated in reference 61, FEIS (pg. 554), "*The reduction in surface flow itself would likely have no impact to riparian vegetation or water quality; it could represent a reduction in recharge to the shallow alluvial aquifer and subflow from Davidson Canyon to Cienega Creek. The distance downstream of the project area (12 miles) that flows have to travel before reaching lower Davidson Canyon gives the predicted effect a high level of uncertainty, as recharge in lower Davidson Canyon is more likely to occur either from very large storm events or from more localized runoff events.*" While item 63 does not provide support for the claim EPA is making, Rosemont has provided a complete response to the letter from Pima County referenced in item 63. Rosemont disagrees with the Pima County reports referenced and has previously provided a response to those reports to the Forest Service that were incorporated into the Supplemental Information Report, 2015 (pg. 76). The analysis was reviewed as part of the SIR process by the Forest Service and ultimately the analysis as performed by Pima County was not used (pg. 48).

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[53] Ibid. Powell *et al.* 2014, Powell *et al.* 2015, and Letter from C.L. Huckelberry, Pima County Administrator, to William James, U.S. Army Corps of Engineers and Kerwin Dewberry, Forest Supervisor, Coronado National Forest, regarding *New Information: Rosemont Copper Mine, Section 404 Clean Water Act*, dated September 28, 2017. [64] Ibid. Powell *et al.* 2014. [65] Leidy, R.A. 2013. Transcribed Field Notes pertaining to observations made within the Cienega Creek Watershed, including Davidson Canyon and Empire Gulch, Pima Co., AZ. San Francisco, California: U.S. Environmental Protection Agency. June 28. [66] SIR (2015). [67] Pima County. October 5, 2015. Memorandum to Dr. Robert A. Leidy, EPA, San Francisco. Cienega Creek base flow and its relationship to water temperature. 5 pp. [68] Amended Final Biological and Conference Opinion for the Rosemont Copper Mine, Pima County, Arizona dated April 28, 2016. [69] Ibid. Powell *et al.* 2014	See comments on reference 55 with respect to comments on reference 64. Additionally, Gila Chub are not found in Davidson Canyon, a portion of which is intermittent, but instead are found only in Cienega Creek per the Amended BO (pg. 74-76). Further, the SIR, 2015 (reference 66) specifically discusses Gila Chub in Cienega Creek (pg. 191-193) and states on page 194 that Gila Chub are only found in Cienega Creek above the confluence with Davidson Canyon. Reference 67 does report a significant effect of water flow on water temperature, however, it contains language regarding the relationship between these variables that is more cautious. Some representative quotes from the document: "*Stream base flow does have a significant impact on water temperature (P = 0.0283) but the effect size is smaller than that for month (e.g., Sum of Squares for month = 568.9 versus Sum of Squares for volume = 9.6)*", "*These results suggest that additional consideration and analyses should be given to better understanding how stream base flow and stream water temperature are related*", "*We recommend that further attention be given to the relationship between stream base flow and water temperature, and that these attentions could include a rigorous and standardized methodology for measuring water temperatures (e.g., see methods in Zeigler et al. 2013), and that these relationships be examined on a larger scale, for example within the Las Cienegas National Conservation Area*" Reference 68 is similar to reference 67 above, there is no language in the BO that directly supports EPA's claim as written, but there is language that more cautiously discusses the relationship between water flow and water temperature. Some representative quotes from the BO: "*The effect of decreased streamflow is that streams become smaller, intermittent or dry, and thereby reduce the amount of habitat available for aquatic species. A smaller stream is affected more by air temperature than a larger one, exacerbating the effects of warm and cold air temperatures (Smith and Lavis 1975)*", "*We also anticipate that reduced flow volumes could result in increased summer water temperatures (Barlow and Leake 2012)...*" Reference 69: It's not clear which document this footnote is referencing (Powell et al. 2014, the BO, or both…); neither appears to substantiate EPA's language here. Powell et al. 2014 only mentions water temperature in the following language: "*...as drawdown occurs, occupied Gila chub pools will reduce in surface water depth, thereby leading to a possibility of increased water temperatures. This could be a problem for this species (and not for Gila topminnow) because of their lower tolerance of high water temperatures (Carveth et al. 2006)*". The BO discusses water temperature as mentioned in the notes for reference 68, but no other relevant reference was readily ascertainable.
In summary, reductions in surface and delayed shallow subsurface water contributions to low-water or base flows will result in decreases in water levels, adversely affect the flow and circulation of water, increase water temperatures[70], potentially result in increased harmful algal blooms, reduce aquatic plant and animal species abundance and diversity, and disrupt the normal functions of the aquatic ecosystem leading to reductions in overall biological productivity.[71] Reductions in stormwater runoff reduces the available assimilative capacity of the downstream waters increasing the concentration or load of pollutants in suspension or solution in the aquatic environment, modifying sediment transport and the water availability for downstream use. This will result in unacceptable adverse impacts to water quality, riparian vegetation and wildlife use, including endangered, threatened and sensitive aquatic species. Therefore, mine-related reductions in the surface flow and surface flow contributions to low-water flow in Davidson Canyon and lower Cienega Creek ONRWs will result in significant degradation of the aquatic ecosystem. [70] Memorandum from Ian Murray, Pima County Office of Sustainability and Conservation to Dr. Robert A. Leidy, EPA, regarding *Cienega Creek Base Flow and its Relationship to Water Temperature*, dated October 5, 2015. [71] See Guidelines, Subparts C and D (40 CFR 230.22-230.23 and 230.30-230.32).	The discussions associated with temperature effects and water levels are not as straightforward as the EPA asserts. The documents cited in support of this claim discuss both this relationship and its potential impacts with considerably more caution than is reflected in EPA's language here. Please see the note on reference 67 above. The assertions of the effects, while referenced to the regulatory requirements, have not been asserted during any of the analysis and simply do not exist in the record. As stated in the FEIS (pg. 554), "*The distance downstream of the project area (12 miles) that flows have to travel before reaching lower Davidson Canyon gives the predicted effect a high level of uncertainty, as recharge in lower Davidson Canyon is more likely to occur either from very large storm events or from more localized runoff events.*" In addition, as demonstrated elsewhere in this response table and in the HMMP completed for the Project, the modeled reductions in stormwater flow are significantly overstated in the FEIS, and the proposed mitigation will more than offset any potential reductions in downstream flow. As such, there will be no significant degradation to the aquatic ecosystem.
Reduction in Sediment Delivery Will Cause Unacceptable Adverse Impacts to Waters in Barrel and Davidson Canyons and Lower Cienega Creek. [72] [72] See Guidelines, Subpart B (40 CFR 230.11(c)).	The cited material 40 CFR.11(c) does not support the concern that EPA has raised, rather it discusses the factual determination required regarding suspended particulate and turbidity. EPA has not performed the analysis, provides no additional information that refutes the work completed by the Forest Service and their consultants, and provides no substantive comment for review or analysis.
At post mine conditions, the Rosemont Mine project will reduce sediment delivery by 32.4% from the	EPA discussions of sediment processes are very similar to those discussed in the FEIS. The sediment processes described are characteristic of any ephemeral system. References cited do not discuss any processes that are specific to Davidson Canyon.

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project site, and by approximately 4% at the Davidson Canyon outlet.[73] These estimates were made based on average annual sediment delivery. Contrary to the conclusions made by the USFS, reduction in sediment delivery to downstream waters will result in unacceptable adverse impacts to waters, including ONRWs.[74] [73] FEIS, Table 104 and DEIS, Table 87. [74] FEIS, p. 466-467.	EPA simply states in definitive terms, "*Contrary to the conclusions made by the USFS, reduction in sediment delivery to downstream waters will result in unacceptable adverse impacts to waters, including ONRWs.*" There is no discussion in the Letter how the magnitude of sediment delivery reduction predicted near the Davidson outlet (of -4% annually compared to the baseline) will equate to a measure of adverse impact. Reference 74's use is unclear. It appears EPA is citing the FEIS to contradict USFS; the USFS conclusions contradict rather than support their assertion that reduction in sediment delivery will cause unacceptable adverse impacts, which leaves the assertion unsupported.
The USFS concluded no change in the geomorphology of the channel is expected to occur because of the proposed Rosemont Mine. Their analysis evaluated average annual sediment delivery, underestimating sediment delivery during high intensity storm events, where runoff amounts and peak rates are key factors in sediment delivery. In addition, they did not use sediment transport models given the difficulty of applying models to ephemeral systems. The USFS' Patterson and Annandale (2012) technical memorandum made no reference to historic and recent flow data at the USGS gage in Barrel Creek at the time of the survey nor did it include any survey of Davidson Canyon Wash during their two-day observational field visit. See technical reports cited (Zeller 2010a, 2010b, 2012) and Technical Memorandum from Patterson and Annandale, Golder Associates, to Chris Garrett, SWCA Environmental Consultants, 2012. [75] Polyakov *et al.* (2010) analyzed 34 years of precipitation, runoff, and sediment data from eight watersheds in Arizona.[75] They found that runoff amount and runoff peak rate were the most important factors for explaining variation in sediment yield. Typical of ephemeral systems, large flows can move great quantities of sediment, and even smaller rainfall events can have notable contributions to sediment yield.[76] Material accumulated during drier periods is released downstream during large, infrequent storms. [75] Polyakov, V.O., Nearing, M.A., Nichols, M.H, Scott, R.L., Stone, J.J., and McClaran, M.O., 2010. Long-term runoff and sediment yield from small semiarid watersheds in southern Arizona, Water Resource. Res. 46, W09512. [76] Ibid. [77] Ibid. Levick *et al.* 2008.	EPA indicates the influence of large flow events on sediment transport, but does not include a discussion of year-to-year variability in the context of sediment yield. As discussed in the FEIS, year-to-year variability in rainfall and runoff will result in variability in sediment delivery. The predicted -4% change near the OAW is likely to be within the year-to-year variability observed. This is discussed in the FEIS (pg. 466): *"Given the spatial variability of storms in this region, precipitation does not often fall evenly over the entire Davidson Canyon watershed. Spatially variable precipitation would result in water flow (and the transport of sediment) from various locations throughout the watershed at different points in time. The nature of storm variability and the nature of the transport limited system would remain relatively unchanged, regardless of the presence of the mine. Therefore, it is reasonable to expect that the system could remain largely unchanged even with mine disturbance upstream, particularly in the lower reaches of Davidson Canyon near the Outstanding Arizona Waters, located approximately 12 miles downstream from the mine itself."* EPA indicates that sediment transport modeling was not performed for impact analysis. As indicated in the FEIS (pg. 466), "*sediment transport modeling (such as HEC-6) was not conducted; the Coronado determined that applying such models to an ephemeral system (Duan et al. 2008; Ruff et al. 1986) would not further inform the analysis.*" Annual average impact analysis was presented to isolate the impact of a change in effective watershed area (only) on sediment delivery.
In addition, sediment is transported in suspension as well as bed load. Sediment may travel in suspension at steeper slopes (*e.g.,* Rosemont Mine site) and as bed-load at shallower slopes downstream.[78] Levick *et. al.* (2008) states, *Ultimately, as headwater streams equilibrate to the new flow regime and their importance as a sediment source declines, channel entrenchment will likely shift further and further downstream. The cumulative effect of many entrenching channels is a significant increase in sediment load in downstream waters*.[79] [78] Letter from C.H. Huckelberry, Pima County Administrator to ADEQ, dated April 4, 2014. [79] Ibid, Levick *et al.* 2008. p. 34.	This information was reviewed and Barrel Canyon was specifically evaluated during the EIS process. Golder Associates produced a July 18, 2012 memo in response to questions raised during the FEIS process. The memo, part of the FEIS record, can be found at http://rosemonteis.us/files/references/patterson-annandale-2012.pdf, accessed 11Jan2018. The memo is specific to the Barrel Canyon system and provides an analysis for the rationale that the system is not sediment limited but rather is sediment transport limited so the concerns raised are unlikely to occur.
Reductions in sediment delivery from the Rosemont Mine will degrade water quality by geomorphologically altering the stream bed, creating soil scour in some downstream areas and aggradation in others. Total suspended sediment will be increased in surface water flows in some reaches. Aggradation and scour will result in the filling and scouring of pools and riffles used by fish and other aquatic organisms. Elevated levels of suspended sediment or moderate-to-high turbidity will likely have significant adverse effects on aquatic organisms in Davidson Canyon Wash and Cienega Creek.	The reductions in sediment delivery are limited by the transport available in the system rather than the actual sediment available. Because of this, the concentration of sediment in the system will not increase and therefore will not cause the effects that EPA has asserted. Specifically, the Golder Associates memo (pg. 4) states "*The geomorphologic investigation that was conducted addresses this concern, indicating that the proposed mine development will have no significant impact on the geomorphology of either Barrel Creek or Davidson Canyon.*"
It has been suggested by the USFS that the presence of downstream bedrock grade control structures will prevent streambed degradation, and sediment transport capacity of flowing water will be maintained despite construction of the Rosemont Mine.[80] Although grade control structures may limit the upstream propagation of down-cutting, they do not correct downstream degradation. Downstream flows will adjust to new equilibrium conditions by increasing sediment discharge downstream of the grade control structure,	From the Golder Associates assessment of Barrel Canyon in 2012 (contained in the Forest Service record as a reference, http://rosemonteis.us/files/references/patterson-annandale-2012.pdf, accessed 11Jan2018) "*2.1 Sediment-transport Limited* *When evaluating the potential impacts for a system, one should consider whether the system is sediment-supply limited or sediment-transport limited. Sediment-supply limited means that the river is transporting as much sediment as is available. The riverbed in a*

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thus increasing channel scour. This condition currently exists at Pantano Dam on Cienega Creek where, to date, there is ten feet of scour below the dam. [80] FEIS, p. 466	*sediment-supply limited system will be composed of an armor layer that is transported only during relatively high flows or the bed may be composed of bedrock. An extreme example of sediment-supply limited is "hungry water" that can occur downstream of a dam.* *Sediment-transport limited is the exact opposite. There is more sediment in the system than the river can transport during normal or even flood-flow conditions. The sediment-transport limited system is common in ephemeral streams, because of the flashy nature of these systems. A large precipitation event will create a pulse of water flowing down the creek. On the rising limb of the hydrograph, the water picks up more and larger particles of sediment and transports them downstream. However, the hydrograph is short. Typical hydrographs contain multiple peaks due to slugs of precipitation from different areas of the watershed (Reid, et al., 1996). The sediment is dropped out of suspension on the falling limb of the hydrograph. Sediment is transported downstream, but it is deposited a relatively short distance from the source. In a sediment-transport limited system, the bed material will be poorly sorted (i.e., all gradations are present). The bed material will be loose, and an armor layer will not be present (Hassan, et al., 2005).* *Barrel Creek is a classic example of a sediment-transport limited system. It is ephemeral, which means that the water only flows occasionally and usually after a precipitation event. The flashy nature of the flows means that sediment is not transported on a regular basis. The bed is composed of a thick layer of unconsolidated sands, gravels, and cobbles. These types of sediment are readily transported during any significant flows within the creek, but the transport stops as quickly as it starts.*"
Discharge of Contaminants from the Rosemont Mine Will Cause Unacceptable Adverse Impacts to Waters in Barrel and Davidson Canyons and Lower Cienega Creek. [81] [81] See Guidelines, Subpart B (40 CFR 230.11(d)).	The title cites to 40 CFR 230.11 (d) which is a discussion of contaminant determinations as it relates to the material proposed for discharge and how it will introduce, relocate or increase the contaminants. The Clean Water Act requires states to certify through the 401 Certification process that the activity complies with all applicable water quality standards, limitations, and restrictions. As presented, the items discussed below do not negate the state's certification.
Reduction in sediment transport and storm flow, and the predicted runoff of mine contaminants from the proposed Rosemont Mine will degrade water quality resulting in significant degradation to downstream waters, including ONRWs.	This statement is not supported by ADEQ who issued the 401 Certification and Fact Sheet. Page 4 of that Fact Sheet states, "*After consideration of the factors above and comments received in response to the public notice, ADEQ finds that if the applicant adheres to the conditions of the CWA §404 permit, the conditions and mitigation required in this State 401 Certification, the mitigation measures required by the ROD and requirements of the 2010 Mining MSGP, the Rosemont Copper Project will not cause or contribute to exceedances of surface water quality standards nor cause water quality degradation in the downstream receiving waters including Davidson Canyon Wash and Lower Cienega Creek.*"
The Rosemont Mine, covering over 4,750 acres, will convert headwater streams which currently serve as sources of freshwater dilution into sources of pollution. This pollution, in the form of heavy metals and other constituents, will run off the mine site and degrade the water quality of downstream waters. The USFS speculates that the contamination coming off the mine will attenuate as it travels downstream to Davidson Canyon ONRW, but this is likely not case. In fact, contaminated mine runoff is additive; increasing concentrations of heavy metals to existing downstream waters and worsening water quality. Concentrations of heavy metals will increase more so, with the diversion of 30-40% of the stormwater that normally flows off the site during the life of the mine.	The statement by EPA is speculative and does not recognize the requirements of the Arizona Pollution Discharge Elimination System Program (AZPDES) that they certified. The AZPDES program requires Rosemont comply with a Multi-Sector General Industrial Permit (MSGP) for Stormwater. This permit has specific criteria for discharge control, best management practices as well as monitoring that are required. Rosemont has received the necessary stormwater permits from ADEQ. Additionally, the analysis performed by the Forest Service was questioned in the 401 Certification; the analysis is provided below.
In the FEIS, the USFS stated that a screening-level analysis of runoff from waste rock indicated two constituents may be elevated in mine runoff at levels that could present antidegradation problems: total and dissolved molybdenum, and total and dissolved sulfate.[82] In the analysis of soil cover runoff, dissolved arsenic, dissolved iron, and dissolved sodium could present antidegradation problems.[83] Dissolved and total mercury is substantially higher than the water quality of downstream waters indicating a potential for degradation from stormwater interacting with soil cover.[84] [82] FEIS, p. 549. [83] Ibid. [84] Ibid. Most waste rock samples contained mercury concentrations below detection limit and therefore were not incorporated into the analysis (the detection limit is higher than surface water standard). One legitimate sample had a very high concentration of mercury (0.03 mg/L).	The section of the FEIS cited here specifically discusses impacts from the soil cover. The soil cover discussed currently exists at the site, so removing this source should actually improve water quality. When the FEIS (pg. 479) is reviewed for the impacts to surface water quality, the following is noted, "*Predictions of runoff water quality from the tailings and waste rock facilities from all action alternatives is not expected to degrade the existing surface water quality in the analysis area, when consideration is given to mitigation measures. Predicted concentrations of dissolved silver exceed surface water standards; concentrations of dissolved silver currently exceed standards in some stormwater samples collected from Barrel Canyon and its tributaries.*" Further, the 401 Certification (pg. 7) issued by ADEQ reviews the work performed by the Forest Service and found that, "*As a component of the APP application, Rosemont conducted Synthetic Precipitation Leaching Procedure (SPLP) testing on a variety of core samples representing the major anticipated waste rock types. SPLP is an EPA testing method to determine the mobility or "leachability" of contaminants in liquids, soils and wastes. According to the FEIS, the predicted water quality for runoff from waste rock does not exceed any applicable surface water quality standards in Barrel Canyon Wash or the associated tributaries except for dissolved silver (FEIS, pg. 472-473). From the SPLP testing, the predicted concentration of dissolved silver in stormwater runoff from the waste rock facility may be 0.0025 mg/l or 2.5 ug/l (Table 105, FEIS pg. 476).* *ADEQ reviewed the same data and finds little likelihood that dissolved silver will exceed SWQS. The applicable SWQS for Barrel Canyon and tributaries are Aquatic and Wildlife – ephemeral (acute), and Partial Body Contact. Many of the surface water quality standards for*

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	metals, in the dissolved fraction, are based on water hardness at the time of sampling. As noted earlier, ADEQ has reviewed the stormwater data collected from Barrel Canyon and tributaries. Of the 37 samples collected for dissolved silver, 26 had both a dissolved silver concentration and a hardness value reported. Of these 26 samples, three had laboratory detection limits greater than the applicable SWQS. None of the remaining 23 samples exceeded the applicable SWQS for dissolved silver based on the in-stream hardness at the time of sampling. If the predicted dissolved silver concentration in stormwater runoff from the waste rock facility is 2.5 ug/l and it exceeded surface water quality standards; that would suggest a water hardness of approximately 85 mg/l as CaCO3, which is very low water hardness for stormwater particularly in a hard rock mining area. Of the 30 samples collected that also had corresponding hardness data, the average hardness was 611 mg/l, with 60% of those samples having a hardness of 350 mg/l or greater. Contrary to the FEIS discussion on page 472-473, ADEQ does not find it likely that dissolved silver will exceed surface water quality standards in runoff from the waste rock facility."
Based on our analysis of the water quality data, stormwater runoff from the mine's waste rock and soil cover contaminated with lead, mercury, molybdenum, selenium, silver, sodium and sulfate will degrade the water quality of Barrel Canyon, Davidson Canyon and Cienega Creek. As shown in Table 2, the water quality of predicted runoff from waste rock and soil cover exceeds the water quality of downstream waters. Mine runoff containing metals such as lead (dissolved) and mercury (dissolved and total) are predicted to be 1-2 orders of magnitude greater than the water quality of Davidson Canyon, an ONRW.[85] [85]Runoff from heavy metals, including mercury runoff, is significantly underestimated due to averaging of test samples.	Table 105 in the FEIS shows an analysis of stormwater runoff that does not account for materials management requirements or geochemical testing required by the Forest Service. EPA's Table 2 combined Table 105 from the FEIS and water quality data submitted to the Forest Service for analysis in the SIR, 2015 that included five samples from a stormwater monitoring station approximately 8 miles above the OAW location specified in the comment. In this analysis, the antidegredation provisions of Davidson do not apply at that location as EPA implies in their table as the location is not "the upstream end of the OAW reach" as Footnote 1 of the table states. EPA did not analyze stormwater quality samples for the Davidson OAW. Reference 85 is an unsupported assertion by EPA. If anything, based on the treatment of the non-detect samples for mercury by the Forest Service (i.e., all non-detects were ignored if the detection limit exceeded the standard rather than using the upper bound of the limit as the result), the concentration of mercury is overstated.
EPA believes compliance point dams will exacerbate the unacceptable downstream water quality impacts. These dams will likely release contaminated runoff in concentrations exceeding predicted stormwater runoff water quality as shown in Table 2. Each dam would be approximately 6 feet tall and approximately 100-200 feet wide with a storage capacity of 2 acre-feet. The dam allows for the settling of sediment, detains stormwater temporarily and is the final onsite location where stormwater will be monitored.[86] During storm events, water that has been in contact with waste rock and soil cover, would be temporarily impounded and slowly released through the porous rock-fill dam. Large storm events may overtop or destroy the dam and proceed downstream.[87] It is anticipated that localized storm events will blow out these storage zones resulting in discharges of concentrated sediment and water-soluble metals contaminating downstream waters. [86] FEIS, p. 46-47 [87] Ibid.	The AZPDES MSGP for stormwater includes the requirement that sediment be managed using best management practices such as sediment traps or velocity dissipation devices. These large sediment traps are specifically planned to assist with the management of sediment and flows from the facility. They will not release "contaminated runoff" but instead provide an opportunity for sediment control through velocity dissipation.
Studies analyzing the patterns of storage, transfer and sediment-associated metal dilution in arid systems reveal the presence of metal contaminants downstream of mine sites. Ciszewski (2001) discusses high magnitude flood events on metal contamination patterns in surface bottom sediments. Sediment associated metals accumulate in the river during periods of low discharge and are suspended and transported during flood events especially during higher-magnitude floods where the risk of metal mobilization increases.[88] This study comports with Navarro *et al.* (2008) which found metal transfer from mines is strongly influenced by a semi-arid climate with heavy rainfall during short rainy seasons contributing largely to the dispersion of pollutants over an extensive area.[89] [88] Ciszewski, D., 2001. Flood-related changes in heavy metal concentrations within sediments of the Biala Przemsza River. Geomorphology 40: 205-218 [89] Navarro, M.C., Perez-Sirvent, C., Martinex-Sanchez, M.J., Vidal, J., Tovar, P.J., Bech, J., 2008. Abandoned mine sites as a source of contamination by heavy metal: a case study in a semi-arid zone. Journal of Geochemical Exploration 96:183-193.	The studies cited by EPA to support the statement regarding metals contamination were specific to Poland (Ciszewski, reference 88) where centuries of mining for lead and zinc have resulted in contamination of the Biala Przemsza River and Spain (Navarro et al, reference 89) where lead and zinc mines have been exploited since antiquity. The assumption that Rosemont, which is being designed using some of the latest technologies available and under strict environmental controls can be compared to these sites calls the entire analysis performed by EPA in this section into question. Note: Rosemont was not able to find reference 88, but was able to review a later version, 2016, of the paper.
Riverbank desiccation and the lack of vegetation in ephemeral channels during the dry season make these	Reference 90, while an interesting paper, has little bearing on the processes at Rosemont. EPA has "cherry picked" statements that

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areas vulnerable to oxidation and transport during the wet season. Remobilization of metals within slack water channel environments via evaporation or during seasonal flooding presents a potential risk to remnant aquatic biota that utilize this aquatic resource.[90] [90] Taylor, M.P., Hudson-Edwards, K.A., 2008. The dispersal and storage of sediment-associated metals in an arid river system: The Leichhardt River, Mount Isa, Queensland, Australia. Environmental Pollution 152:193-204	support their position without fully explaining that the Leichhardt River in this paper received regular mine tailings releases up until the 1940's effectively becoming a tailings repository. The Mount Isa area has been mined for copper, lead, zinc and silver since the 1930's in Australia. It is unclear what the study of historic contamination effects in Australia has to do with Rosemont.
Heavy metals can cause significant harm to human health and the environment. Heavy metal contamination from the mine is persistent, impairs aquatic life use, and cannot be easily mitigated or removed from stream channels. A heavy metal such as mercury, can bioaccumulate, biomagnify in [91, 92] aquatic food chains causing significant toxicity in the aquatic environment. Mobilization of mercury in an aqueous phase can be influenced by many processes primarily precipitation and dissolution of solids, complex formation and redox reactions. In semi-arid environments, dissolution of mercury and metal-sulfate salts results in their transport during episodic high intensity storm events. Per Navarro (2008), this is likely the case for other heavy metals such as iron, lead and zinc.[93] [91] Navarro, A., 2008. Review of characteristics of mercury speciation and mobility from areas of mercury mining in semi-arid environments. Rev. Environ. Sci. Biotechnol. pp. 287-306. [92] U.S. Environmental Protection Agency. 1997. Mercury study report to Congress: An ecological assessment for anthropogenic mercury emissions in the United States. Vol. 6. EPA-452/R-97-008. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards and Office of Research and Development. December. [93] Ibid. Navarro. 2008	Again, the references, while interesting and accurate to the possible effects have little to nothing to do with the Rosemont project. There is no support for the statement that "Heavy metal contamination from the mine is persistent, impairs aquatic life use, and cannot be easily mitigated or removed from stream channels." All analysis by ADEQ and the Forest Service found that the effects from Rosemont were expected to not degrade surface water (FEIS pg. 479).
Uptake of selenium by biota causes toxicity in aquatic organisms. Several studies have concluded that selenium expresses its' toxicity in mammals, birds and fish primarily through the food chain, with bioaccumulation of selenium in aquatic plants and invertebrates leading to toxicological impact and change in aquatic communities.[94] Maier *et al.* (1998) as cited in Hamilton (2004) found that short pulse precipitation events can quickly load selenium into an aquatic environment where it can remain in the ecosystem.[95] [94] Hamilton, S., 2004. Review of selenium toxicity in the aquatic food chain. Science of the Total Environment 326: 1-31. [95] Ibid	As described above, the references, while interesting and accurate to the possible effects have little to nothing to do with the Rosemont project. There is no support for the statement that "Heavy metal contamination from the mine is persistent, impairs aquatic life use, and cannot be easily mitigated or removed from stream channels." All analysis by ADEQ and the Forest Service found that the effects from Rosemont were expected to not degrade surface water (FEIS pg. 479).
Downstream contamination of surface waters underestimated. We believe impacts to downstream water quality resulting from the Rosemont Mine will be greater than estimated by USFS. Although Rosemont Copper Company proposes several design and mitigation measures to try to prevent release of mine influenced waters, the hydrological and geochemical analysis presented by the USFS underestimates the level of contamination to downstream waters including ONRWs, if the Rosemont Mine is constructed.[96, 97] [96] A study on the predicted and actual water quality of 25 hard rock mines found 24% exhibited inadequacies in hydrologic characterization, 44% in geochemical characterization, 64% exhibited failures in mitigation (16% of the mines had ineffective waste rock mixing and segregation). Kuipers, J.R. Maest, A.S., MacHardy, K.A., Lawson, G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements. [97] A 2012 study on 14 of 16 currently operating U.S. copper mines found 100% experienced pipeline spills or accidental releases, 92% had water collection and treatment systems fail, 28% had partial tailings impoundment failures and 64% had tailing spills. U.S. Copper Porphyry Mines: The track record of water quality impacts resulting from pipeline spills, tailings failures and water collection and treatment failures.	EPA's assertion regarding the impacts to downstream water quality from Rosemont is simply not supported by these references. Reference 96, produced in 2006 was a study of mines in operation from 1979 through 2005 and would not reflect the analysis, or the design, currently planned by Rosemont. Rosemont commissioned a review of this study dated December 23, 2011 that is part of the project record with the Forest (record number 016810) to ensure the concerns in the paper were incorporated into our plans. Reference 97 was a review of operating mines from 1988 through 2012. This paper discusses tailings impoundment failures and tailings spills and water collection and treatment system failures, none of which apply to Rosemont. Further, it is unsurprising that older facilities may have equipment failures, as most of the mines in this study have been in operation for nearly 70 years.

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Gestring. B. Earthworks. July 2012.	
• ***Infiltration and seepage***. While the mine is designed to retain runoff from the tailings facility, uncertainty remains regarding seepage of contaminants to downstream waters from both the tailings facility and the waste rock storage area. A technical review of the infiltration and seepage models by SRK Consulting found that estimates of infiltration and seepage in dry stack tailings facility have the potential to be underestimated annually or seasonally owing to the use of average daily precipitation in the model given that rain occurs year round with greater daily amounts during the winter months and late summer "monsoon" season.[98,99] In addition, SRK Consulting states, *SRK's experience shows that field construction errors are another source of seepage that is greater than expected or modeled* (pp. 2-4). A study by Kempton and Atkins (2000) found evaporation in unvegetated rock slows dramatically as the surface dries and only the top few centimeters in waste rock or pit benches are dry enough to slow oxidation.[100] Given that sulfide oxidation in waste rock is typically limited by oxygen transport and higher moisture content reduces the diffusivity of oxygen, it is suggested that sulfide oxidation rates in mine waste may be faster in dryer climates than in wet.[101] [98]SRK Consulting. Hoag, P.G., M. Sieber, J. Rasmussen. Memo to Chris Garrett, SWCA dated July 18, 2012. Rosemont Copper DEIS – Response to EPA Geochemistry Comments – Final. [99]In a June 2012 Infiltration, Seepage, Fate and Transport Modeling Report by Tetra Tech, additional seepage and infiltration models were developed. In this analysis, average climate conditions were still used for the dry stack tailings facility. For the waste rock storage area, daily measured climate conditions utilizing rainfall data at the University of Arizona (UA) Tucson Meteorological Station (2,440' elevation) were used in the model. At a higher elevation of 5,350', the Rosemont Mine is susceptible to greater rainfall amounts and intensity due to the orthographic effects. Therefore, the UA daily climate measurements are not comparable. Pima County Regional Flood Control District (PCRFCD) found the storm water analysis unacceptable and provides detailed comments on the problems associated with using precipitation values not representative of the site (letter to ADEQ from PCRFCD dated February 2, 2012 regarding the Draft Aquifer Protection Permit). [100] Kempton, H., Atkins, D., 2000. Delayed environmental impacts from mining in semi-arid environments. In Proceedings from the Fifth International Conference on Acid Rock Drainage 2:1299-1308. May 20-24, Denver, Colorado. Published by Society for Mining, Metallurgy, and Exploration, Inc. [101] Ibid.	The information stated by EPA reflects the condition as it existed for the Draft EIS, however in the course of the EIS process, the Forest Service and ADEQ set specific requirements in order to ensure that impacts from the tailings and waste rock were minimized. Those requirements include: 1. Geochemical testing of waste material followed by specific management of materials that are potentially generating. This includes kinetic testing of materials and encapsulation. FEIS Appendix B (pg. B-19 to B-21), and ADEQ APP Permit 2. A change in water management requirements to ensure that no water pools on the facilities long term. FEIS Appendix B (pg. B-23 to B-24) 3. Waste rock cover over the tailings at closure to encapsulate the tailings. ADEQ APP Permit 4. Lysimeters installed in the waste rock at key locations to monitor and validate the seepage models. FEIS Appendix B (pg. B-16 to B-17) Additionally, geochemical testing of the waste rock has shown it to be acid consuming, FEIS (pg. 469). It states, "*Direct precipitation and runoff from the landform have the potential to generate acid rock drainage because sulfide minerals, such as those proposed to be mined, have the potential to generate sulfuric acid when exposed to water and air. Based on the overall abundance of potential acid-neutralizing rock types, as defined by geochemical sampling and testing, it is believed that the naturally occurring lime content of the ore bearing and waste rock material would neutralize any sulfuric acid produced in the processed ore (tailings) or waste rock and that the generation of acid rock drainage is unlikely (Tetra Tech 2010b). Because the tailings and heap leach facilities, as well as any waste rock with potentially acid generating material, would be buttressed and capped with inert or acid-neutralizing rock, the potential for acid rock drainage is considered low. Note that independent peer review of the Rosemont Copper expert reports concurred with this conclusion (Ugorets and Day 2010; Hoag, Bird and Day 2012; Hoag, Sieber and Rasmussen 2012).*" Reference 100, specifically discusses oxidation of copper sulfates creating an acidic environment in the waste rock and tailings which is not expected to occur at Rosemont.
Averaging of waste rock types and sample results. Samples analyzing mine runoff were averaged by waste rock type and weighted based on the percentage of each waste rock type to be present in the waste rock facility. These values do not reflect the upper and lower bounds of metal concentrations that would occur in runoff from the mine site.[102] For example, per the FEIS, predicted waste rock runoff for copper is 0.0085 mg/L, yet individual samples range from ND – 0.3 mg/L. Davidson Canyon stormwater water quality for copper ranges from 0.0029 to 0.017 mg/L. Therefore, some samples were over 17x greater than the highest concentration found in Davidson Canyon. In addition, the weighted average represents the mine over the entire life. However, a storm event resulting in significant runoff can occur at any given time throughout the project life. Depending upon what waste rock material is exposed in the waste rock pile, or other disturbed areas at the time of such an event, runoff water quality would be reflective of the rock types exposed, rather than the overall weighted average within the pit. Therefore, degradation of water quality downstream of the mine has the potential to be [103,104] significantly greater than is presented in the FEIS and SIR for any given storm event. [102] Draft Memorandum Revised Analysis of Surface Water. Chris Garrett, SWCA. August 25, 2013 http://www.rosemonteis.us/files/references/045677.pdf [103] FEIS, p. 472. For both the SPLP and MWMP samples analyzed, there were instances where laboratory detection limits were greater than the surface water quality standard (*e.g.*, silver). [104] *The result is that actual water quality is literally always different than predicted, with the general*	The evaluations provided here give an indication of the uncertainties and how the Forest Service responded using management requirements to ensure compliance. The overall statements by EPA are correct, however, as noted in the memo (reference 102), the SPLP results were used to approximate BOTH dissolved and total metals but because the filters used for SPLP are 0.6 to 0.8 micron filters, they may OVERESTIMATE the concentrations for the dissolved fraction which requires a 0.45 micron filter. When the stormwater results for Barrel Canyon are examined, the range of copper for dissolved is ND to 0.152 mg/l and for total is ND to 29 mg/l. Davidson Canyon results provided to the Forest Service for the SIR 2015, show the range of copper for dissolved at 0.0071 to 0.017 mg/l and for total at 0.029 to 0.39 mg/l, illustrating that EPA misstates the upper range for the total fraction. Both Barrel and Davidson Canyon samples show that the range for the analysis of copper would be expected and may not be indicative of a problem of a magnitude of 17 as asserted. Rosemont agrees that the waste rock exposed to stormwater will be the determining factor in the runoff calculation, but EPA has dismissed the specific management requirements that the Forest Service and ADEQ have put into place (FEIS Appendix B, pg. B-19 to B-21, and ADEQ APP Permit). Further, the statement referencing footnote 104 appears to ignore the last part of the language quoted, "with the general expectation that it is generally consistent". This language in no way supports EPA's statement that the degradation has the potential to be significantly greater.

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expectation that it is generally consistent. Mark A. Williamson, PhD, Geochemical Solutions, LLC to Kathy Arnold, Rosemont Copper Company dated December 23, 2011. *Perspectives on Uncertainty in Water Quality Predictions*.	
• ***Ability to segregate waste rock***. Rosemont Mine is proposing to segregate waste rock to mitigate the exceedance of the water quality standard for silver. There is great uncertainty in the ability to effectively segregate waste rock, particularly singular constituents. It is often dependent on whether the constituent is distinct (*i.e.,* clear boundaries) in the waste rock and whether the operator, based on methodology, is effective and committed to segregation.[105] [105] SIR, p. 34.	Waste rock management is something that is required by both the FEIS and the APP permits based on acid generating potential of the waste rock, not a single constituent element. The SIR (pg. 34) referenced does not support this sentence. Although this page of the SIR does acknowledge waste rock segregation techniques, it does not substantiate any of the uncertainties regarding the efficacy of these techniques that EPA describes.
• ***Assumption that attenuation reduce downstream contamination***. The USFS predicted the water quality of mine runoff would be attenuated based on: 1) the assumption that the mine area covers 14% of the watershed; and 2) the remaining undisturbed portion of the watershed would attenuate contaminants contained in mine influenced runoff before reaching downstream ONRWs. These assumptions are incorrect. The impacts of the mine are not proportional to the catchment area. In addition, the analysis leading to this assumption does not consider the spatial and temporal nature of precipitation in the region or the additive effect of mine pollutants in downstream waters.[106] [106] SIR, p. 135	SIR p135 does not address any of the statements made in this section and in fact states, "*These conclusions were based in part on the same conclusions drawn above: "Ambient stormwater quality, representing background conditions pre-mining, exceeds surface water quality standards for several parameters including copper, lead, and silver. Under current conditions, these exceedances do not appear to be impacting water quality in the downstream OAWs" (Arizona Department of Environmental Quality 2014).*" ADEQ performed an analysis to ensure stormwater runoff would not degrade the OAW prior to issuing the 401 Certification and found "*After consideration of the factors above and comments received in response to the public notice, ADEQ finds that if the applicant adheres to the conditions of the CWA §404 permit, the conditions and mitigation required in this State 401 Certification, the mitigation measures required by the ROD6 and requirements of the 2010 Mining MSGP, the Rosemont Copper Project will not cause or contribute to exceedances of surface water quality standards nor cause water quality degradation in the downstream receiving waters including Davidson Canyon Wash and Lower Cienega Creek.*" EPA issued a letter to ADEQ that had similar comments as contained here on the 401 Certification. In response to EPA's comments, ADEQ requested that Rosemont provide a copy of a Surface Water Mitigation Plan prior to issuance of the Certification, which has since been provided.
Contamination of the Mine Pit Lake Will Cause Unacceptable Wildlife Impacts. [107] [107] See Guidelines, Subpart B 40 CFR 230.11(d) and (e).	The title cites to 40 CRF 230.11 (d)and (e) which is a discussion of contamination determinations or nature and degree of effect on the aquatic environment/ecosystem as they relate to the material proposed for discharge. The open pit is not a discharge and not a regulated activity under the 404 program. The reference is inappropriate.
The post-mine closure mine pit lake would have a volume of 96,000 acre feet, making it one of the largest water bodies in southern Arizona.[108] Surface water features such as lakes are an attractant to animals and their prey in arid environments. Invertebrates, birds, amphibians, reptiles and potentially small mammals would be able to either access or consume prey from the mine pit lake. Mine pit lake water quality will likely exceed wildlife standards for three contaminants that are known to bioaccumulate, including cadmium, mercury and selenium and for other contaminants as well (*i.e.*, copper, lead, zinc and ammonia)[109] As such, the mine pit lake water would serve as a chronic source of toxic heavy metals to wildlife species through consumption of contaminated water or food chains.[110] [108] Pima County letter dated March 21, 2014. [109] SWCA Environmental Consultants. 2012. Memorandum: comparison of pit lake water quality to surface water quality standards. July 29, 2012., FEIS, p. 664. [110] SIR, p. 28-29.	The statement made by EPA regarding the pit lake is more appropriately referenced in the FEIS (pg. 387) where the discussion on the pit lake and associated modeling can be found. The potential for metals to exist in the pit lake after closure has been disclosed and evaluated during the EIS process. The pit lake is regulated under other laws and rules and not under the 404 determination for a impact of fill. EPA overstates potential food web-related impacts of the pit lake, as these effects are modulated by a series of factors. For example, water hardness affects the uptake of metals by aquatic organisms (e.g. Bury et al. 2003). The potential for uptake of contaminants by aquatic biota also depends on the amount of available habitat, which is influenced by physical characteristics of the pit lake. Notably, more steeply-sided pit lakes provide less habitat for aquatic plants, as steeper slopes limit the area around the lake where light penetration is sufficient to support photosynthesis (Hakonson et al. 2009). In turn, limited amounts of habitat for aquatic plants constrains the abundance and diversity of invertebrates, which can be expected to result in limited use of the pit lake by terrestrial and aquatic vertebrates (Hakonson et al. 2009). As such, considering that the slopes of the Rosemont pit lake are expected to be relatively steep (up to a 48 degree slope; Augusta Resource Corp. 2007), food web-related impacts of the pit lake on wildlife may be less than those assumed by EPA. Moreover, even if the pit lake were to contain suitable habitat and support wildlife, the effects of pit lake chemistry on a given organism would depend on its tolerance and toxicity thresholds, which vary widely among taxa (e.g. Eisler 1993). Additionally, if the pit lake affects wildlife through food web dynamics, these effects may be limited in space. For example, in a study of several passerine bird species that nested and fed near mercury-contaminated water bodies, Howie (2010) demonstrated that mercury levels in both invertebrate prey and their passerine predators were elevated only from ~250 to ~650 meters away from contaminated water bodies. Beyond these distances, mercury levels in the blood and feathers of the focal bird species were indistinguishable from background levels (Howie 2010). Full citations:

EPA Comment	Rosemont Response
	Augusta Resource Corporation. 2007. Rosemont Project: Mining plan of operations. Bury, N.R., P.A. Walker, and C.N. Glover. 2003. Nutritive metal uptake in teleost fish. Journal of Experimental Biology 206: 11-23. Eisler, R. 1993. Zinc hazards to fish, wildlife and invertebrates: A synoptic review. Patuxent Wildlife Research Center contaminant hazard reviews, report 26, April. Hakonson, T.E., V.F. Meyer, and A. Dean. 2009. Significance of biological productivity of pit lakes for interpreting ecological risks, pages 178-186 in Mine pit lakes: Characteristics, predictive modeling, and sustainability, Volume 3 (Castendyk, D.N. and L.E. Eary, eds.). Howie, M. 2010. The Lateral Extent and Spatial Variation of Mercury Exposure in Birds and their Prey near a Polluted River. Master's Thesis. College of William and Mary.
Of sixty-nine species of migratory birds listed by SWCA as potentially impacted by the mine, 53 species are identified as being susceptible to mine pit contamination primarily from eating invertebrates originating from the pit lake, including sixteen species listed by the Forest Service or BLM as special [111,112] status. In addition, two amphibian, three reptile and six mammal species listed as special status would be exposed to mine pit contaminants by ingesting prey items originating in the mine pit lake.[113] Bats are known to forage locally or travel considerable distances to drink or forage over water on aquatic and terrestrial insects.[114] Six sensitive bat species (*i.e.*, pale Townsend's big-eared bat, western red bat, western yellow bat, fringed myotis, cave myotis, pocketed free-tailed bat and big free-tailed bat) feed on insects, and because the mine pit water quality could exceed wildlife standards for the three contaminants known to bioaccumulate, secondary impacts will likely occur from bats eating aquatic contaminated invertebrates originating from the mine pit lake, thereby altering bat health and overall predator-prey relationships.[115] Some bats preferentially forage over waterbodies in arid environments.[116] Insectivorous bats require daily water and in arid Southwestern states artificial waterbodies may provide the nearest local source of surface water.[117] Given the large size of the pit lake and the tendency for many organisms to either breed within, or drink and acquire prey from large waterbodies, it is highly likely that various animal species will be adversely impacted by consuming contaminated invertebrates originating from the mine pit lake. It is also likely that many animals that ingest and bioaccumulate contaminated prey from the mine pit lake and subsequently disperse to other nearby aquatic habitats will be eaten by other predators in the food chain. For example, Chiricahua leopard frogs could be directly exposed to contaminants should individuals disperse to and occupy the pit lake. Effects to species could also occur from eating winged aquatic invertebrates originating from the mine pit lake site.[118] [111] SWCA Environmental Consultants. 2013. Migratory Bird Analysis. Proposed Rosemont Copper Mine, Nogales Ranger District, Coronado National Forest. Tucson, Arizona: SWCA Environmental Consultants. December. [112] SWCA Environmental Consultants. 2013b. Biological Evaluation, Rosemont Copper Project, Santa Rita Mountains, Nogales Ranger District. Prepared for U.S. Forest Service, Coronado National Forest. Tucson, AZ: SWCA Environmental Consultants. [113] FEIS, pp. 681-696. [114] O'Shea, T.J., Clark, D.R., and Boyle, T.P., 2000. Impacts of mine-related contaminants on bats. pp. 276-292, *in* Proceedings of Bat Conservation and Mining: A Technical Forum. K.C. Vories and D. Throgmorton eds., St. Louis, MO. [115] FEIS, p. 696. [116] Ibid. [117] Kurta, A., 2000. Bats on the surface: the need for shelter, food and water. pp. 264-275, *in* Proceedings of Bat Conservation and Mining: A Technical Forum. K.C. Vories and D. Throgmorton eds., St. Louis, MO. [118] USFWS Amended Biological Opinion dated April 28, 2016. p. 152.	The FEIS disclosed the possible impacts to the species via the pit lake and the FWS evaluated these potential impacts to endangered species during the Section 7 process. There is nothing in the FEIS (pg. 696) as referenced by the EPA (116) that states bats would preferentially forage over waterbodies in arid environments. Further, the reference 118 to the Amended BO does not expand the analysis to winged aquatic invertebrates but instead is specific to the CLF. Again, the pit lake is regulated under other laws and rules and not under the 404 determination for a impact of fill EPA overstates potential impacts of the pit lake on certain taxa. Notably, leopard frogs (*Lithobates* spp.), including the northern leopard frog (*L. pipiens*), have been used as indicator species in toxicology studies. The northern leopard frog is more closely related to a subgroup of leopard frogs containing the Chiricahua leopard frog (*L. chiricahuensis*) than it is to other leopard frog species (Hillis and Willcox 2005), which enables comparisons that could be informative of potential pit lake effects on Chiricahua leopard frog. Northern leopard frogs are unaffected by lead concentrations of 10 µg/L (Chen et al. 2007), which is similar to predicted lead concentrations in the pit lake (FEIS pg. 388, Table 75). While lead concentrations of 100 µg/L caused adverse effects on performance and development (Chen et al. 2007), this far exceeds predicted lead concentrations in the pit lake, though it must be noted that concentrations between 10 and 100 µg/L were not evaluated. Similarly, cadmium concentrations of 5 µg/L can increase mortality and affect development in northern leopard frogs (Gross et al. 2007), but again, predicted cadmium concentrations in the pit lake are considerably lower (FEIS pg. 388, Table 75). While there is less information regarding heavy metal toxicity for other taxa mentioned by EPA here (reptiles and bats), Hopkins et al. (2002) demonstrated that banded water snakes can accumulate selenium and other metals with no observable effects. As such, the claims made by the EPA regarding the effects of contaminants on wildlife species is uninformed by the available literature that addresses specific toxicological effects on relevant species. Full citations: Chen, T., J.A. Gross, and W.H. Karasov. 2007. Adverse effects of chronic copper exposure in larval northern leopard frogs (*Rana pipiens*). Environmental Toxicology and Chemistry 26: 1470-1475. Gross, J.A., T. Chen, and W.H. Karasov. 2007. Lethal and sublethal effects of chronic cadmium exposure of northern leopard frog (*Rana pipiens*) tadpoles. Environmental Toxicology and Chemistry 26: 1192-1197. Hillis, D.M., and T.P. Wilcox. 2005. Phylogeny of the New World true frogs (*Rana*). Molecular Phylogenetics and Evolution. 34: 299-314. Hopkins, W.A., J.H. Roe, J.W. Snodgrass, B.P. Staub, B.P. Jackson, and J.D. Congdon. 2002. Effects of chronic dietary exposure to trace elements on banded water snakes (*Nerodia fasciata*). Environmental Toxicology and Chemistry 21: 906-913.

EPA Comment	Rosemont Response
The Rosemont Mine Will Result in a Violation of Water Quality Standards in Barrel and Davidson Canyons and Lower Cienega Creek, Including the ONRWs.	Rosemont disagrees with the header for the reasons discussed below.
EPA has determined that contamination from the Rosemont Mine will lower existing water quality in Davidson Canyon and Cienega Creek ONRWs. Designated as Tier 3 waters, lowering of water quality is prohibited and therefore in violation of State Water Quality Standards.[119] Violation of water quality standards is also prohibited under the Guidelines (40 CFR 230.10(b)). EPA has discussed the analysis of the Rosemont Mine's impact on water quality with the Corps and ADEQ since 2012, concluding the state's CWA §401 certification lacks sufficient specific preventative actions to safeguard the water quality of Tier 3 waters in the Cienega Creek watershed.[120] We recognize there are water quality aspects which may be outside the scope of the state's §401 review. These aspects must be considered in determining compliance with the Guidelines. In Mingo Logan v. EPA, the court ruled that under 401, *the CWA has identified state requirements as a floor that must be met, not a limit on federal authority*.[121] The ruling goes on to state there is nothing in the statute that forecloses EPA from imposing stricter requirements than those required by the state standards.[122] [119] Federal antidegradation policy prohibits any degradation of Tier 3 waters, regardless of economic or social development needs (40 CFR 131.2(a)). Arizona's antidegradation rules reinforce this prohibition (ACC R118-11-107). Minor, short-term impacts are considered if they do not interfere with the character of the ONRW. The temporary exception is limited to an impact of 6 months or less. If constructed, the Rosemont Mine will cause persistent, permanent significant impact to the biological, chemical and physical integrity of the ONRWs. [120] ADEQ issued the §401 CWA certification to Hudbay on February 3, 2015. See EPA letter to ADEQ dated April 7, 2014 and EPA letter to the Corps dated April 14, 2015 regarding the mine's ability to comply with §401 CWA. [121] Mingo Logan Coal Company v. U.S. Environmental Protection Agency. Memorandum Opinion, U.S. District Court for the District of Columbia. September 30, 2014. p. 56. [122] This ruling is consistent with the August 15, 1979 legal opinion of the Office of General Counsel on the designation and protection of ONRW. They concluded, "if a State voluntarily designates an ONRW, EPA can take whatever action is necessary (against point sources) to protect the ONRW."	EPA's assertion that Rosemont will lower water quality in the OAW in Davidson Canyon has not been supported by the technical analysis performed during the EIS process or in the 401 Certification process. Evaluations of data have shown that the current conditions at the site show a surface water quality baseline that is higher than the estimated runoff values from the Rosemont project. Because the current data are higher, the runoff water cannot degrade the water quality leaving the site. Comparisons of leachate from SPLP tests directly to runoff water samples four miles downstream or to standards that may or may not represent baseline twelve miles downstream is not a demonstration of impact. Rosemont believes ADEQ, as the regulatory authority, has appropriately addressed the potential for degradation in their 401 Certification Fact Sheet (pg. 4), "*...Rosemont Copper Project will not cause or contribute to exceedances of surface water quality standards nor cause water quality degradation in the downstream receiving waters including Davidson Canyon Wash and Lower Cienega Creek.* " EPA's references to *Mingo Logan* and and the General Counsel opinion from 1979 are inapposite. In the first place, EPA is not seeking to impose higher and more stringent standards than imposed by ADEQ. Rather it is disputing, without a sound foundation to do so, ADEQ's conclusions regarding whether the Project will comply with state surface water quality standards. Moreover, the context in which EPA was seeking to impose higher standards in *Mingo Logan* was in the exercise of its authority under Section 404(c) of the Clean Water Act to "veto" a permit. Here EPA is commenting on a pending permit application and is not operating pursuant to its 404(c) authority. It is important to note that unlike the requirement in reference 122, Rosemont is not a point source of pollutants and does not discharge directly to an OAW or even directly to the drainage containing the OAW. The fill activity takes place twelve miles upstream in an ephemeral system in a drainage that is tributary to the drainage containing the OAW some 12 miles distant.
Our determination of significant degradation to the existing water quality of the ONRWs is based upon the following considerations: • Change in ambient concentrations predicted at the appropriate critical flow condition(s); • Change in pollutant loadings; • Reduction in available assimilative capacity; • Nature, persistence and potential effects; and • Potential for cumulative effects.	EPA provided their concerns in comments to ADEQ and to the Forest, which have been addressed throughout the process. • EPA provided comparisons of leachate from SPLP tests to stormwater but did no concentration or pollutant loading calculations. ADEQ checked the work from the FEIS, disagreed with the methodology and provided the calculations to bolster their conclusion of no degradation of water quality. • The reduction of assimilative capacity was specifically addressed in Special Conditions for the 401 Certification. ADEQ received a copy of the required Site Water Mitigation Plan prior to issuing the 401 Certification. The mitigation proposed in that plan, and carried forward in the HMMP, will more than offset any potential reductions in downstream flows. • The effects determinations by EPA have been associated with activities not covered by the fill activity or not regulated by the Corps. Additionally, they disagree with the assessment by the FWS and 40 CFR 230.30(c) specifically addresses those authorities.
As shown in Table 2, mine runoff consisting of heavy metals such as mercury, lead, molybdenum, selenium and silver as well as sulfate will be released in concentrations exceeding the stormwater quality for Davidson Canyon ONRW. These heavy metals and other constituents will be transported downstream through stormwater and lower the water quality of Davidson Canyon and Cienega Creek in violation of water quality standards.[123] Changes in stream hydrogeomorphology from the mine will result in increases in total dissolved solids, suspended sediments, lowering of dissolved oxygen and increases in temperature from declining pool levels resulting lower water quality in lower Cienega Creek, in violation of water quality standards.[124] In the amended Biological Opinion, the FWS analyzed the effect of the Rosemont Mine on water quality examining the significant relationship between reductions in stream flow, increases in temperature, and decreases in dissolved oxygen. The FWS concluded that reduced stream flow in lower Cienega Creek, *will increase the incidence of poorer water quality that adversely affects aquatic life in Pima County, CCNP.* [125]	It is necessary to put into perspective the drainage as discussed by EPA. The samples shown as concentrations at the Davidson Canyon OAW are actually at a monitoring station on Rosemont Property that is approximately 8 miles above the OAW and approximately 6 miles below the toe of the Rosemont facilities. Lower Cienega Creek is approximately 3 miles below the OAW. At each location, the watershed expands to include more area, more impacts, and more land uses. For instance below the monitoring station on Rosemont property but above the OAW there is a winery, a housing development, a quarry, several ranching operations that include stock tanks, roads for private residences, septic tanks, and wells. Comparing the leachate from Rosemont's testwork directly with stormwater samples taken in Davidson Canyon ignores the analysis that has been completed by ADEQ and the concerns raised by the Forest Service. SIR (pg. 134) describes the uncertainties associated with the direct comparison. "*Stormwater quality clearly changes greatly in the intervening 12 miles between the mine site and lower Davidson Canyon. Just as runoff in Barrel Canyon is empirically demonstrated to be dissimilar to Davidson Canyon stormwater runoff, it is reasonable to assume that mine site runoff would be equally dissimilar to Davidson Canyon, and it would be inappropriate to directly compare mine runoff that far downstream.*"

<table>
<tr><th>EPA Comment</th><th>Rosemont Response</th></tr>
<tr><td>[123]Designated uses in the OAW section for Davidson Canyon include Aquatic and Wildlife (ephemeral) and Partial Body Contact. The designated uses in the OAW section for lower Cienega Creek are Aquatic and Wildlife (warm water) and Partial Body Contact.
http://www.azdeq.gov/environ/water/standards/download/SWQ_Standards-1-09-unofficial.pdf
[124] The Arizona Water Quality Standards narrative biological criteria (WQS) (R118-11-108) for lower Cienega Creek is: A wadable, perennial stream shall support and maintain a community of organisms having a taxa richness, species composition, tolerance, and functional organization comparable to that of a stream with reference conditions in Arizona. ADEQ doesn't have a temperature WQS, but temperature is a pollutant and the designated use of A&W must be protected. Raising a temperature to a level that harms the organisms in the waterbody would be in violation of the standard.
[125] Amended Biological Opinion dated April 28, 2016. p. 48.</td><td>Adding distance to Cienega Creek in as well as the additional contributing watershed areas and all of the intervening activities will also exacerbate the concerns raised by the Forest Service. In a Tetra Tech memo from 2011 http://rosemonteis.us/files/references/zeller-2011a.pdf (pg. 2), the watershed sizes are given and are summarized below:
• USGS gaging station (just below the project footprint) - 14.0 square miles
• At the Barrel/Davidson confluence - 15.0 square miles
• At the Davidson Canyon old USGS gaging station - 50.5 square miles
• At the Davidson/Cienega Confluence - 51.3 square miles
• At the lower end of Lower Cienega - 457 square miles

The Project will impact approximately 7.2 square miles above the USGS gaging station.</td></tr>
<tr><td>Accordingly, Section 131.12(a)(1) of the antidegradation policy is not satisfied regarding fills in wetlands or other waters if the discharge results in "significant degradation" to the aquatic ecosystem as defined under Section 230.10(c) of the 404(b)(1) Guidelines.[126]

[126]See. Questions and Answers on: Antidegradation, Question #13, EPA, Office of Water Regulations and Standards, August 1985.</td><td>While the reference is correct, the assumption that there is significant degradation is incorrect.</td></tr>
<tr><td>Table 2. Predicted contaminant runoff from Rosemont Mine compared to existing downstream water quality for Davidson Canyon and Barrel Canyon
<table><tr><th>Metals and other constituents</th><th>Predicted Runoff Water Quality from Waste Rock (mg/L)1</th><th>Predicted Runoff Water Quality from Soil Cover (mg/L)1</th><th>Davidson Canyon Stormwater Water Quality Data (mg/L)2</th><th>Barrel Canyon Stormwater Water Quality Data (mg/L)3</th><th>Surface Water Standard for Aquatic and Wildlife Ephemeral -Acute (mg/L)</th><th>Surface Water Standard for Partial Body Contact (mg/L)</th></tr><tr><td>Lead (total)</td><td>0.0048</td><td>0.0151</td><td>0.0110.266</td><td>ND-6.5 (0.01-0.1)</td><td>No Standard</td><td>0.015</td></tr><tr><td>Lead (dissolved)</td><td>0.0048</td><td>0.0151</td><td><0.00059-<0.00099</td><td>ND-1.2 (0.0020.15)</td><td>0.05637</td><td>No Standard</td></tr><tr><td>Mercury (total)</td><td>0.0002</td><td>0.0101</td><td><0.001</td><td>ND-0.0029 (0.0001-0.01)</td><td>No Standard</td><td>0.28</td></tr><tr><td>Mercury (dissolved)</td><td>0.0002</td><td>0.0101</td><td><0.001</td><td>ND (0-0.002)</td><td>0.005</td><td>No Standard</td></tr><tr><td>Molybdenum (total)</td><td>0.0405</td><td>0.0117</td><td><0.01</td><td>ND-0.024 (0.01-0.1)</td><td>No Standard</td><td>No Standard</td></tr><tr><td>Molybdenum (dissolved)</td><td>0.0405</td><td>0.0117</td><td>ND</td><td>ND-0.095 (0.01-0.1)</td><td>No Standard</td><td>No Standard</td></tr><tr><td>Selenium (total)</td><td>0.0200</td><td>0.0200</td><td>0.0060.018</td><td>ND-19.1 (0.0020.25)</td><td>0.033</td><td>4.667</td></tr><tr><td>Silver (dissolved)</td><td>0.0025</td><td>0.0025</td><td><0.00082-<0.0014</td><td>ND-0.0341 (0.0010.05)</td><td>0.00081</td><td>No Standard</td></tr><tr><td>Sulfate (total recoverable)</td><td>33.13</td><td>1.98</td><td><5.0-5.5</td><td>ND-66 (3-5)</td><td>No Standard</td><td>No Standard</td></tr><tr><td>Sodium (dissolved)</td><td>4.167</td><td>6.1</td><td>Not recorded</td><td>2.518</td><td></td><td></td></tr><tr><td>Sodium (total)</td><td>4.167</td><td>6.1</td><td><5.0</td><td>7.008</td><td>No Standard</td><td>No Standard</td></tr></table>[1]Predicted runoff water quality (mg/L) from the mine. Red denotes concentrations exceeding water quality of Davidson Canyon at upstream end of OAW reach. Results reflect the average of the test samples (FEIS, Table 105, pp. 475-477 and SIR, p. 33-34).</td><td>This comparison by EPA provides an interesting look at the water quality in Davidson Canon as well as illustrating the concerns raised. As stated in prior sections, the tests from the SPLP cannot be accurately compared to dissolved or total analytical data as the SPLP testing specifies a filter of 0.6 to 0.8 microns and not the required 0.45 microns necessary for the dissolved fraction.

Rosemont must meet the surface water standards for an ephemeral system which would be applicable to Barrel Canyon. A comparison shows that the predicted runoff in all cases, except possibly dissolved silver, which suffers from the filtering problem specified above, meet the required water quality standard. A comparison against Davidson Canyon standards for an antidegredation requirement does not apply in the receiving waters in Barrel Canyon (4 miles to the confluence with Davidson) nor does it apply to the Davidson Canyon OAW (approximately 12 miles below the Rosemont Site).</td></tr>
</table>

EPA Comment	Rosemont Response
[2]Water quality data for Davidson Canyon (4 dates). Memo of Water Quality/Water Level Data for USFS from Karen Herther, Hudbay, to file dated January 16, 2015. ND=Not Detected. [3]Barrel Canyon range of results (8 locations on 15 dates). Lab detection limits in parentheses (FEIS, Table 105)	
Mitigation Proposed for the Rosemont Mine Will not Prevent Water Quality Degradation of ONRWs.	It is unclear what mitigation is being addressed in this header. ADEQ required mitigation for flow in the 401 Certification in part in response to EPA's concerns regarding assimilative capacity and flow reductions. Subsequent and on-going sampling of stormwater in the drainage has lead to additional information showing that the OAW's themselves do not meet the standards for stormwater that have been set in the triennial review. Rosemont provided the Corps with this information on December 6, 2016 in an information packet along with an analysis of mining in the watershed that may be causing the water quality affect. In addition, the mitigation described in the HMMP (i.e. the removal of four stock tanks) will more than offset any potential reductions in downstream flows, such that EPA's description of impacts to the OAW's is significantly overstated.
The State's Certification relies on a requirement for Rosemont Mine to develop a Surface Water Mitigation Plan (SWMP).[127] The SWMP lacks detailed measures demonstrating Rosemont Mine's ability to arrest and reverse the heavy metal contamination in stormwater which will degrade downstream water quality. In summary: • The SWMP relies on voluntary monitoring which will not prevent the contamination of downstream waters; • The surface model used as a predictive tool to quantify changes in surface water runoff from the mine has not been developed; and • Rosemont Copper Company has not demonstrated a measurable water supply and delivery to mitigate reduction in surface flow caused by the mine.[128] [127] CWA§401 Certification, Specific Condition dated February 3, 2015, #1, p. 6 [128] See EPA letter to the Corps dated April 14, 2015. A predictive tool is highly questionable given the asynchronous nature of precipitation in the semi-arid region and in consideration of climate change and drought.	Based on comments by the EPA, ADEQ did not issue the 401 Certification until the Surface Water Mitigation Plan (SWMP) was issued. EPA states that the plan should "demonstrate Rosemont Mine's ability to arrest and reverse the heavy metal contamination in stormwater." As the Corps is aware, and as Rosemont has proposed in the HMMP, the plan is specifically designed to replace waters and alleviate concerns regarding the loss of stormwater flows to the Barrel Canyon/Davidson Canyon drainage system. The plan was in response to EPA's comments regarding the assimilative capacity in the system for contaminants. Rosemont has since monitored stormwater within the Davidson Canyon and Barrel Canyon system in an effort to understand the need for "assimilative capacity" and has found that Barrel Canyon and the mineralization in the headwaters may in fact be the source of water quality concerns in the drainage. Rosemont has prepared a response to EPA's concerns regarding the plan to eliminate stock ponds and the calculations associated with that plan in the response to comments on the HMMP. Further, Rosemont plans to work with ADEQ to modify the SWMP to conform to the Corps HMMP if a 404 permit issued.
The Rosemont Mine Will Cause Unacceptable Adverse Effects to Municipal and Private Water Supplies. [129] [129]See Guidelines at Subpart F (40 CFR 230.50).	The citation 40 CFR 230.5 is specific to the discharge of fill material. The effects that EPA discusses are pumping effects for production water that will happen 12 miles away in an area actively managed by the Arizona Department of Water Resources (ADWR) or effects caused by pit drawdown which is not regulated under the 404 permit process. This concept is more fully discussed in another response document prepared by Rosemont.
Municipal and private water supplies. The Guidelines require consideration of the potential effects of the project on municipal and private water supplies. Effects to the quality and quantity of surface water and ground water supplies must be evaluated. EPA has determined the proposed Rosemont Mine will result in unacceptable adverse impacts on municipal and private water supplies through reduction in water quantity and the degradation of water quality.	The guidelines at 40 CFR 230.50 are specific to the discharge of fill material. There are no municipal water supplies or private water supplies in the discharge area and none of the effects described below are as a result of the discharge of fill material. Rosemont has also worked with the appropriate agencies to ensure that appropriate mitigation is available for impacts. All activities described below have been duly authorized by the appropriate permitting agency. ADWR has issued groundwater withdrawal permits for mineral extraction. ADEQ has determined the quality of groundwater will not be affected by the project and has issued an Aquifer Protection Permit with specific requirements and monitoring to ensure water quality surrounding the facility is protected. Even though it is not a fill activity, groundwater drawdown associated with the pit is addressed in the response to EPA's specific comments on that issue.
The proposed Rosemont Mine is located within the Tucson Active Management Area (AMA). The AMA was established to manage the state's finite groundwater resources.[130] As of 2013, water use within the AMA consists of 47.7% groundwater and 37.9% Central Arizona Project (CAP) along with 4.6% effluent and 9.3% in lieu groundwater.[131] Although the AMA has a statutory goal of achieving and maintaining safe-yield by 2025, the ability to attain safe yield is uneven.[132] Some basins achieve safe yield while other wide areas continue to experience significant overdraft.[133] The impact of mining on local water table levels is very significant.[134] Significant ground water pumping for projects like the Rosemont Mine may further jeopardize the ability of the AMA to achieve a "safe yield" by 2025. [130] http://www.azwater.gov/AzDWR/WaterManagement/AMAs/default.htm. To establish an AMA, at least 1	Rosemont Project facilities are located outside of the Tucson Active Management Area (TAMA), while production pumping for the Project is located inside of the TAMA. Arizona Department of Water Resources (ADWR) sets specific requirements for industrial facilities to limit their water use and to ensure the goals of the AMA can be achieved. Rosemont's Dry Stack tailings process exceeds any requirement by ADWR to achieve the water conservation goals for mining. Further, Rosemont has partnered with Community Water Company of Green Valley (CWCGV) to recharge CAP water in the basin near the area where project pumping will occur. This agreement is part of the FEIS (Appendix B pg. B-93) and will enable CWCGV to recharge their CAP allotment into the service area. Reference 133 discusses additional information regarding water use, specifically page 17 states, *"Mining is the only activity that grew in employment without mirroring increments in water flows, thus becoming more efficient per hour of human activity."* While page 22 recognizes Rosemont storage activities, "*The last piece of this complex puzzle is the Long-Term Storage Credit system. The most recent*

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criteria must be met: 1) preserve existing groundwater for future use; 2) land subsidence is endangering property or groundwater storage; or 3) actual or threatened water quality degradation due to groundwater use. [131] Email dated November 5, 2015 from Pam Muse, Supervisor, AMA Planning and Data Department, ADWR to Elizabeth Goldmann, EPA. http://www.azwater.gov/azdwr/StatewidePlanning/WaterAtlas/ActiveManagementAreas/documents/Volume_8_final.pdf, p. 46. [132] http://www.azwater.gov/azdwr/WaterManagement/AMAs/TucsonAMA/TAMAOverview.htm. Safe yield means that the amount of groundwater pumped from the AMA on an average annual basis does not exceed the amount that is recharged. [133] Cabello, V., N. Hernandez-Mora, A. Serrat-Capdevila, L. Del Moral, E. Curley. 2016. Water use and sustainability in the Tucson basin: Implications of spatially neutral groundwater management. In Gupta H., Gupta M., Poupeau F., Serrat-Capdevila A., (Eds) Water Banruptcy in the land of plenty. Steps towards a transatlantic and transdisciplinary assessment of water scarcity in Southern Arizona, pp. 289-316. [134] Ibid. "Disconnection of recovery from recharge sites entails local impacts over water table levels driven by mines and new developments." P. 1.	*update of credits accrued in 2014 showed a total of 1.4 M AF (1129 Mm3, nearly four times total water demand in 2010), an increase of 80% since 2009 (see Table 5). During the last five years, the AWBA has been especially focused on recharge within the Tucson basin, accounting for 50% of the total LTSC. Other major owners are Tucson Water (15.6%), CAGRD (8.6%), Tohono O'odham Nation (6.2%), the Bureau of Reclamation (5%) and the Rosemont mine company Augusta Corporation (3%) (ADWR, 2015b).*" The partnership with CWCGV will allow Rosemont to recharge water near the production pumping location. By using technology and recharging, Rosemont meets the conservation requirements of the AMA and has developed a plan to ensure the project does not affect the safe yield goals of the AMA by the 2025 date. Because EPA does not recognize the mitigation proposed by Rosemont, the statement by EPA is simply speculative.
Two groundwater basins within the AMA would be impacted by the proposed mine, adversely affecting overall groundwater availability.[135] Rosemont Mine proposes to pump water supply for the mine from wells located in the Santa Cruz Valley near Sahuarita in the Upper Santa Cruz Subbasin.[136] In addition, active pumping of the mine pit within the Cienega Basin would remove groundwater from the regional aquifer. Groundwater declines can lead to increased pumping costs, decrease in water quality, riparian damage, land subsidence and land fissuring and permanent compaction of the aquifer all of which have occurred in the AMA.[137] [135] FEIS, p. 338. [136] During the life of the proposed Rosemont Mine, total water use pumped from the Upper Santa Cruz Subbasin is estimated at 100,000 acre-feet. This averages 5,000 acre feet per year (afy) of fresh water during operations. The water would be pumped from 4-6 wells near Sahuarita in the Santa Cruz Valley at 5,000 gallons per minute. FEIS, p. A-11. [137] http://www.azwater.gov/azdwr/StatewidePlanning/WaterAtlas/ActiveManagementAreas/documents/Volume_8_final.pdf. p. 54.	The reference 135 does not state what EPA has asserted. The statement actually is, "*In addition to impacts to specific wells from groundwater drawdown, there is the potential to affect overall groundwater availability within the Upper Santa Cruz Subbasin and within the Tucson Active Management Area as a whole. Within the Upper Santa Cruz Basin Subbasin, the 5,400 acre-feet per year represents a 6 to 7 percent increase over the current estimated pumpage demand of 82,000 acre feet; within the entire Tucson Active Management Area, it represents a 2 percent increase over the estimated pumpage demand of 252,000 acre-feet.*" The analysis asserts a potential not a certainty. The FEIS (pg. 338) also discusses subsidence, which is a current problem within the basin. The statement is, "Land subsidence associated with groundwater withdrawal in the Santa Cruz Valley is expected to continue in association with the degree of pumping in excess of recharge. This subsidence is being monitored by the ADWR and currently is occurring in the Sahuarita area at a rate of 0.7 to 1.4 inches per year. The incremental withdrawal from the Upper Santa Cruz Subbasin for the mine water supply would contribute to the overall groundwater withdrawal from the Sahuarita area that has resulted in the land subsidence observed in the area." The determination regarding the potential for subsidence in the Cienega Basin is also specifically addressed in the FEIS (pg. 339). "*However, the greatest drawdowns and the greatest changes in hydrostatic pressure would be experienced in the area considered, and the lack of cave or karst features suggests a relatively low chance for subsidence.*"
Upper Santa Cruz Subbasin. Groundwater levels in the Upper Santa Cruz Subbasin have historically decreased by 1 to 3.5 feet per year and are projected to decrease by 3.5 to 6.5 feet per year.[138] It is estimated that water supply pumping for the mine over the 20-year active mine period will result in an increase in the rate of groundwater drawdown to a total decrease of 5 to 8 feet in groundwater levels per year. This represents a 6 to 7% increase over the current pumpage demand.[139] With the Upper Santa Cruz Subbasin already in decline, pumping of water from the regional aquifer for the operation of the proposed mine would lower groundwater levels, which would reduce groundwater availability to existing wells and water users. Because of pumping water supply for the mine, an estimated 500-550 private and municipal wells would be significantly impacted by drawdown in groundwater levels.[140] Groundwater-level drawdown is estimated to be as great as 90 feet immediately adjacent to the pumping locations and 10 feet or less approximately 3-4 miles (42 square miles) from the Rosemont Copper properties during active mining.[141] The cone of depression will not stop expanding until 100-140 years after pumping ceases. The 10-foot drawdown is projected to expand an additional 1 to 2 miles laterally before it stops expanding, encompassing approximately 78 square miles.[142] When pumping ceases, recovery would not occur unless water levels in the regional aquifer begin[143,144] increasing.	The statements made with respect to references 138 and 139 are correct and state the analysis performed for the FEIS. What is not stated are the assumptions associated with the overall analysis. The increase in pumping is not only associated with Rosemont, but is also associated with four planned housing developments that would cover 13,000 acres. Rosemont has committed to the recharge project described in the FEIS (Appendix B pg. B-93) which will alleviate some of the concerns regarding the drawdown itemized here. The drawdown effects are within the normal range of agricultural pumping in the area which is expected to lessen as pecan groves are transferred to housing developments in one of the four planned housing developments. The recharge project that Rosemont is working on was not considered in the analysis provided for the FEIS, because of this, the impacts will be overstated and conservative as to impact.

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[138] By 2030, projected water deliveries of groundwater in the Sahaurita area will almost double, and private wells will likewise double their groundwater withdrawal. FEIS, p. 356. [139] FEIS, p. 338 and p. 356. [140] Shallow wells are not assessed. Drawdowns could occur but the model is not able to predict these specific impacts. [141] If active mining is extended to 25 years (estimated upper range), the additional drawdown due to the mine water supply pumping would range from 7.5 to 17.5 feet. FEIS p. 336. [142] FEIS, p. 336. [143] FEIS, p. 330. [144] FEIS, Table 58, p. 337.	
Davidson Canyon/Cienega basin. The watershed where the Rosemont Mine is located provides 20% of the groundwater recharge in the Tucson basin.[145] Water originating from Cienega Creek can be identified in the groundwater of the Tucson basin.[146] According to the FEIS, the mine pit would create a permanent drawdown of the water table. During active mining, groundwater would be pumped directly from the mine pit or from dewatering wells next to the mine pit. After closure, the pit will gradually fill with groundwater, forming a mine pit lake. The mine pit lake is expected to act as a permanent regional hydraulic sink, resulting in long-term impact on groundwater hydrology in the vicinity of the mine.[147,148] During active mining, estimates of pit dewatering are as high as 650 gallons per minute, resulting in approximately 13,000 – 18,500 acre-feet of water removed from the aquifer.[149,150] Groundwater drawdown from the mine's pit within the Davidson Canyon/Cienega Basin, would significantly impact an estimated 360-370 well owners with water level declines over 10 feet.[151] If mine contamination of groundwater occurred, water supplies for Tucson and Vail could be at risk.[152] [145] Letter to ADEQ from Pima County Administrator, Chuck Huckelberry dated March 21, 2014. Eastoe, C., A. Gu and A. Long. 2003. *Stable Isotope Tracers Reveal Flow Paths*. Geoscience News. 2 pp. [146] Eastoe, C.J., Ailang, G. 2016. Groundwater depletion beneath downtown Tucson, Arizona, a 240-year record. Universities Council on Water Resources Journal of Contemporary Water Research and Education. Issue 159, pp. 62-77. [147] After 150 years, the area within the 5-foot contour encompasses approximately 50,000 acres. [148] Once mining has ceased, water lost to evaporation in the mine pit would be partially offset by groundwater flowing into the mine pit lake, perpetuating the aquifer drawdown caused by the mine pit dewatering. Models estimate equilibrium would not be reached until 700 to 7,000 years after mine closure. FEIS, p. 291 and p. 329. [149] FEIS, p. 353. [150] SIR, p. 24. [151] Some well owners may experience up to 85 feet of water level decline if the wells are connected to the regional aquifer. FEIS, p. 350-352. [152] Letter from C.L. Huckelberry, Pima County Administrator, to William James, U.S. Army Corps of Engineers and Kerwin Dewberry, Forest Supervisor, Coronado National Forest, regarding *New Information: Rosemont Copper Mine, Section 404 Clean Water Act*, dated September 28, 2017.	As stated before the Rosemont site at the USGS gage accounts for 14 square miles of the 457 square miles that make up Cienega Creek. If Cienega Creek makes up 20% of the watershed feeding the Tucson Basin (something that is not validated by the reference cited), then the Rosemont watershed makes up 3% of that total (14/457) or approximately 0.6% of the entirety of the drainage. The actual Rosemont operations impact approximately half of the total land at the USGS gage which means that the impact to the Tucson Basin by Rosemont is conservatively less than 0.5%. Rosemont reviewed the groundwater drawdown, the wells registered for domestic use (associated with a property), and the potential to area of effect and found that there are 247 parcels with 97 registered wells (this list did not include businesses or duplicate owners). An information package regarding a well owners protection plan (recorded with the Pima County Recorder Sequence 20121720146 on June 20, 2012) was offered to 192 property owners. This program, while not required, was offered to the well owners to provide a pump warranty and deepening of their well if necessary. Again, none of the potential drawdown is associated with a fill activity but instead with pumping or pit development that is regulated through other entities. The reference 152, does not support the statement made and relies on the assertion that Rosemont may impact 20% of the groundwater recharge. This statement further ignores the permitting authorities of ADEQ and their aquifer protection permit, their stormwater permits or the 401 Certification.
Water quality impacts from groundwater depletion in wells. In addition to a reduction in well water quantity for owners and users, groundwater depletion in wells may adversely impact water quality. Withdrawal of good quality water from the upper parts of inland aquifers can allow underlying natural or manmade pollutants to concentrate in the remaining groundwater degrading water quality.[153,154] [153] http://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/USGS_Groundwater%20Depletion%20Across%20the%20Nation.pdf	The information in references 153 and 154 again, while interesting, is not specifically applicable to Rosemont. For instance, reference 154 discusses overdraft in California and the potential problems associated with saltwater intrusion and pesticides as it relates to groundwater drawdown caused by pumping overdrafts.

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[154] http://waterinthewest.stanford.edu/groundwater/overdraft	
Residential Well Protection Program. Rosemont Copper Company offered a voluntary Well Protection Program for private residential well owners against the risk of mine-associated groundwater drawdown. These agreements were offered to well owners in "well protection areas" identified by the Rosemont Copper Company that may be subject to well draw down from operation of the proposed mine. The program is two-fold: 1) a pump warranty program for well components; and 2) a water well deepening program to deepen a well that has failed.[155] An In Lieu Cash payment of $5000.00 and $15,000.00, respectively, is also offered.[156] Pump damage or well depletion is determined solely by Rosemont Copper Company. The length of the warranty is unclear. Property owners have voiced concerns to EPA regarding the threat to a clean and reliable water source, and economic hardship should the mine be constructed.[157,158] [155] Rosemont Copper Company decides whether the decline in water levels is greater than the natural annual or seasonal fluctuations experienced in the area because of monitoring at key monitoring sites chosen by the company. Deepening is limited to the existing registered well depth plus 50%, or a maximum of 600 feet below land surface, whichever is less and is limited to one attempt to deepen the well. This does not include wells for irrigation. Well owners entering this contract waive all claims against Rosemont Copper Company for interference with the water levels in the area. In addition, this contract does not include protection from any water quality degradation. There is no protection for well owners who choose not enter into this legally binding agreement. *Rosemont Copper Company Eastside Well Protection Program.* [156] It is not known how many private well owners signed up for the program. [157] Letter from property owners, Gregory and Carol Shinsky to EPA, February, 2012. [158] As depth to water increases, power costs to drive the pump increases with the yield of the well declining below usable rates. http://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/USGS_Groundwater%20Depletion%20Across%20the%20Nation.pdf	This program, discussed above, is a voluntary program offered to the well owners in the area. The opportunity to take advantage of the program is strictly up to the property owners. Water levels would be monitored at well locations and the information made available to the well owners, however because this area is outside of the AMA, there is no restriction on pumping so Rosemont could not be held responsible for pumping for agriculture operations such as the wineries, quarries, or cattle ranching. Water elevations in the area fluctuate on a short term (2007-2009) average 7.1 feet annually and in the longer term 19.7 feet (1970's-2009 depending upon the well) (Forest Service Project Record No. 012126, Montgomery and Associates, March 1, 2010). This same memo showed the range of fluctuations of 0.71 feet to upwards of 69 feet. Rosemont has not received any correspondence from the Carol or Greg Shinsky regarding the well owner program, other than to state that they are not interested in the program. Mr. and Mrs. Shinsky also did not participate in the meetings to change the language in the agreement to address their concerns so we are unable to comment on their letter or the assertion made by EPA.
Groundwater Recharge. Rosemont Copper Company has committed to recharging 105 percent of water pumped from the Santa Cruz Basin (105,000 acre feet).[159] As of 2009, 45,000 acre-feet have been recharged by the company, yet only 600 acre feet of that total have been recharged within the Upper Santa Cruz Subbasin where impacts to private well owners will occur. Given the uncertain location where water would be recharged in the future, it is unknown whether actual drawdown in the Upper Santa Cruz Subbasin would be offset.[160] Also, groundwater recharge is a voluntary measure and given the likely water shortages in the Colorado River over the next few decades, it is unlikely Rosemont Copper Company will be able to meet their commitment to recharge with excess water from CAP. Arizona Department of Water Resources is currently negotiating cuts on Colorado River water deliveries.[161,162] If necessary, excess water deliveries, such as those utilized by Rosemont Copper Company would be reduced and portions of CAP recharge operations would cease. If further reductions are required, CAP would even recover water stored to meet Arizona's obligations.[163] [159] This is a voluntary measure in a License for a Right-of-way Encroachment agreement with the Town of Sahuarita. Recharging would be based on "available" CAP water. FEIS, p. 360. [160] FEIS, p. 360. [161] http://www.cap-az.com/public/blog/508-arizona-is-rising-up-to-meet-the-challenges-of-falling-water-levels-at-lake-mead, http://tucson.com/news/local/big-cap-cuts-coming-as--state-water-agreement-nears/article_876e3aa6-6cf0-53ec-bd0c95be8c6468ae.html [162] Central Arizona Project Issue Brief Strategic Initiatives and Public Policy dated October, 2014. [163] http://www.cap-az.com/documents/public-information/Shortage-Issue-Brief.pdf and http://www.azwater.gov/azdwr/ColoradoRiverShortagePreparedness.htm	The recharge percentage is correct, Rosemont has committed to recharge 105% of the water pumped, the 105,000 acre feet is not part of the requirement in the FEIS. The recharge requirement is voluntary in the FEIS but it is not voluntary in the License for the Right of Way Encroachment for the Town of Sahuarita, it is a requirement. The statement regarding recharge locations is correct from the FEIS (pg. 360, reference 160) however EPA omits the next two sentences. "*Wherever future recharge occurs, the Tucson Active Management Area as a whole would benefit, but it is unknown whether actual drawdown in the Upper Santa Cruz Subbasin would be significantly offset. The presence of the pipeline extension funded by Rosemont Copper would allow for the possibility that future recharge can occur in the area of pumping and that the recharge credits currently acquired could be traded for recharge of "new" or "wet" water near the site of pumping.*" These sentences are important when viewed in the greater context. Rosemont has requested a CAP allocation as part of the Non-Indian Agriculture Priority CAP Water Reallocation and ADWR has recommended Rosemont receive an allocation of 1,124 ac-ft annually to ensure that offset can be made if they are available. (See http://www.azwater.gov/AzDWR/PublicInformationOfficer/documents/NIAEvaluationCriteriaAssumptionsasAttach2.pdf, and https://www.usbr.gov/lc/phoenix/reports/capadwr/capadwrDEA.pdf)
The adverse effect of the Rosemont Mine on private and municipal water supplies is significant. Groundwater pumping for the mine will reduce available groundwater supply, possibly degrade water	The impacts EPA discussed throughout this section are not associated directly with the fill activity but more appropriately assigned to the pumping activities which are managed through ADWR. All mitigation measures were incorporated into the FEIS (Appendix B, pg. B-92

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quality and cause significant economic hardship for private and municipal water users. Voluntary measures proposed by the Rosemont Copper Company to mitigate for impacts to water supplies are unreliable and unenforceable and will not offset the significant impacts to water users in the AMA.	and B-93).
The Rosemont Mine Will Cause Unacceptable Adverse Effects to Water-Related Recreation and Aesthetics.[164] [164] See Guidelines, Subpart F (40 CFR 230.52 and 40 CFR 230.53)	The sections cites 40 CFR 230.52 and .53 are both related to aquatic ecosystem uses. The area of the fill activity is an ephemeral system where most drainiages are numbered forest service roads. The recreational "loss" in the area is not specific to aquatic uses but instead can occur anywhere roads are available. The Rosemont project aesthetic values are described in the EIS as discussed below.
Water-related Recreation. Several water-related recreational opportunities exist on lands within and adjacent to the Rosemont Mine. These include wildlife observation, bird watching, camping, biking, and hiking along streams within the Cienega Creek watershed. The Rosemont Mine would alter and destroy aquatic resources which support these recreational activities, as well as restrict use adversely affecting recreationists	None of the recreational activities listed are specifically "water related" as the areas on and adjacent to the Rosemont Project are xeroriparian. Cienega Creek has running waters that are five or more miles from the project site. The FEIS specifically discusses aesthetics and project effects in the FEIS (pg. 767 - 833). Water related recreational activities were not listed in the FEIS under recreational activities (pg. 833-875). Impacts to streams within the Cienega Creek watershed are characterized as speculative in the FEIS (pg. 661), "*While very small levels of groundwater drawdown may be modeled to occur at distant locations like Cienega Creek, these predictions are highly uncertain, and any quantification of changes in stream flow due to changes in groundwater is largely speculative. Further, natural variability with these riparian systems has been documented and indicates that several feet of fluctuation in groundwater levels regularly occur, generally with no ill effects.*"
Per the FEIS, Rosemont Mine will result in a loss of 6,177 acres of National Forest Service (NFS) lands available for recreational use. Currently, commercial outfitter and guides operate throughout the forest, including 20 different birdwatching guides.[165] Bird-watching and hiking would be restricted in the Cienega Creek watershed due to exclusion of public access from the area within the perimeter fence.[166] In addition, 7.3 miles of Arizona National Scenic Trail would need to be relocated. Activities affecting birding in and adjacent to the project area include direct loss of habitat, noise, dust, lighting, increased traffic, changes to springs, riparian vegetation and pit lake water quality.[167] Industrial noise would be noticed near the perimeter fence and along much of the Arizona National Scenic Trail. [165] FEIS, p. 851. [166] SIR, p. 233. [167] FEIS, p. 853.	The Forest Service evaluated the recreational use and the impacts. The FEIS (pg. 851) states currently only one all-terrain-vehicle touring service operates in the project area and one equestrian group uses the Arizona Trail. The birdwatchers and hunting guides are not specific to the project site but instead refers to the entire Santa Rita Ecosystem Management Area consisting of 148,431 ares (FEIS pg. 841) that includes Madera Canyon and other areas that will not be impacted. The area to be restricted will be the project site only, located outside of what is commonly called Cienega Creek in Barrel Canyon (a tributary to Davidson canyon which is tributary to Lower Cienega Creek). The SIR (pg. 233) discusses relocation of the trail but the relocated trail will total 12.8 miles rather than 7.3 miles and does not discuss exclusion of public access within the perimeter fence. The SIR also directly conflicts with the last statement made by EPA and states, "*while industrial noise would be noticed near the perimeter fence but not evident from most of the Arizona National Scenic Trail for the remaining action alternatives.*" Impacts associated with the activities enumerated in FEIS (pg. 853) are also said within that statement to "*decrease with distance from the project area*".
Economics. Construction of the mine will adversely affect outdoor recreation and quality of life enjoyed by the public and private property owners. The loss of values for consideration include impairment of natural resources (*e.g.*, degradation of habitat) which support recreation activities such as birdwatching, hiking and sightseeing. Arizona Game and Fish Department noted the mine's impacts would, "render the northern portion of the Santa Rita Mountains…worthless for wildlife recreation.[168] A study conducted by the Sonoran Institute shows that approximately 2.95 billion is spent annually for tourism and outdoor recreational activities in Pima and Santa Cruz Counties. Their analysis states that if the proposed project displaces only one percent of travel and tourism-related spending in the region, the economic loss would be greater than the entire annual payroll of the mine.[169] According to the USFS, the change in tourism ranges from a $1.0 million to $3.6 million dollar annual reduction in visitor spending, and a 15 -50% decrease in nature-based tourism from 0 to 10 miles from the mine per year.[170] The FEIS estimated the total annual economic losses in the greater Tucson area from reduced tourism at $1.2 million to $6.5 million.[171] Increase in sky brightness as a result of the proposed project will impair observatories near the project area which could result in a decrease in state revenues generated from astronomy, space, and planetary resource and tourism.[172] [168] Letter from Joan E. Scott, Habitat Manager, AZGFD to Beverly Everson, CNF dated July 8, 2008. [169] Marlow, J.E., 2007. Mining's potential economic impacts in the Santa Rita and Patagonia mountains region of southeastern Arizona. Sonoran Institute Study. [170] SIR, p. 262. [171] FEIS, p. 1113. [172] SIR, p. 262	The letter referenced from AZGFD was provided during the scoping phase of the EIS prior to an impacts analysis or an assessment of mitigation was performed. The statement quoted is prefaced by "*Our preliminary review indicates…..*" which gives an indication of the analysis performed. The bulk of the letter contains questions regarding the Forest Service process and issues for consideration during the EIS process and does not consider the alternative chosen by the Forest as the preferred alternative nor any of the required mitigation. The Forest Service performed a full evaluation of the potential impacts to tourism from the Rosemont project which can be found in the FEIS (pg. 1109-1113). The impacts associated with economics were fully reviewed by the Forest Service during the FEIS process. The FEIS (pg. 1103-1104) details the benefits associated with Rosemont. The pre-mining annual income (for Pima, Santa Cruz and Cochise Counties) has been estimated to be $41.2 million with an estimated $18.2 million in indirect labor increases, this would be for the engineering and construction phases of the project. The active mining, final reclamation and closure labor for the same counties is estimated at $29 million and the indirect labor at $55 million annually. In Pima County, the total economic impact of construction spending is estimated to be $585.2 million. During active mining, final reclamation and closure spending is separated by the company ($90 - $158.1 million annually to local vendors), vendors ($127.1-$225.2 million annually), and employees ($21.7-$29.2 million annually). Tax revenues generated by the project are estimated at $6.3 million per year and indirect revenues are estimated at $4.7 million annually. Additionally, mitigation for concerns about tourism losses were addressed by the Forest in the FEIS (Appendix B, pg. B-63 to B-65), while concerns regarding sky brightness were addressed in the FEIS (Appendix B, pg. B-56 to B-60).

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Aesthetics. The Rosemont Mine would impact regional visibility resulting in adverse scenic quality well beyond the mine footprint. The Coronado National Forest's (CNF) mountain ranges known as "sky islands" reach elevations exceeding 10,000 feet providing high quality scenery and a diverse range of habitats.[173] A national Forest Service survey showed more than 67% of visitors to CNF participate in viewing nature; affirming the importance of the aesthetics of the area. Twenty-five percent of CNF visitors travel on a forest scenic byway.[174] Per the FEIS, *Approval of the forest plan amendment would allow actions that would result in impacts to visual resources. With all action alternatives, the proposed mine would result in permanent detrimental impacts to visual quality. While design features and mitigation measures would result in minor reductions in negative impacts to scenic quality, they would not be sufficient to obscure the impacts or visibility of residents, visitors, and travelers in the planning area.*[175] [173] FEIS, p. 767. [174] FEIS, p. 767. [175] FEIS, p. 833	The Forest Service used the FEIS process to analyze impacts and aesthetics. As discussed above, the FEIS specifically discusses aesthetics (visual impacts) and project effects in the FEIS (pg. 767 - 833). The project will affect the Forest Service property within Barrel Canyon.
The proposed project, when added to past, present and future actions and combined with trends that impact visual quality, would result in cumulatively adverse, permanent impacts on scenic quality within the region because of the surface disturbances and landscape contrasts associated with these activities. Additionally, fugitive dust production from the mine would increase the adverse impacts to long-distance scenic viewing of the Santa Rita Mountains and other scenic mountain ranges within the region in the short and long term.[176] [176] FEIS, p. 867	The reference 176 or the FEIS (pg. 867) is a discussion of the Scholefield Alternative and does not support this sentence.
The USFS uses a Forest Service Scenery Management System to apply a systematic and consistent method to analyze impacts to forest scenic quality. This methodology was applied to the proposed Rosemont Copper Project.[177] The proposed Rosemont Mine would create significant changes to the landscape in perpetuity as follows:[178] • 186,893 acres will have visibility of the mine area; • 2.8 miles of Arizona National Scenic Trail will have direct line-of-sight views of the mine area; • Permanent, major adverse impacts from highly visible waste rock and tailings piles; and • Strong contrasts and adverse impacts from highly visible pit face and diversion channel. [177] FEIS, p. 770-771. [178] FEIS, Table 148. Summary of Effects.	The FEIS (Table 148, pg. 780-781) does not characterize the changes to the landscape visibility as "in perpetuity" and in fact the only feature identified as having a perpetual impact is the pit, which is not visible from the area or travelways. The FEIS (pg. 808) recognizes the effect reclamation has on the scenic quality evaluations. None of the acres that are stated are correct from the FEIS Table 148. Correct numbers: • 264,795 acres of project area regional visibility; • 8.7 miles of Arizona National Scenic Trail will have direct line-of-sight views of the mine area (trail rerouted to be at a distance so the impacts are lessened);
In summary, the Rosemont Mine would impact regional visibility and would result in adverse scenic quality well beyond the mine footprint. Visual impacts would be significant and adverse.[179] The proposed Rosemont Mine project would mar the beauty of natural aquatic ecosystem by degrading water quality, creating distracting disposal sites, inducing inappropriate development, and destroying vital elements that contribute to the compositional harmony or unity, visual distinctiveness, or diversity of an area. [179] FEIS p. 833	The FEIS (pg. 833) does not specifically support the statement made, although the context is correct, the Rosemont project does impact the visual landscape as determined by the Forest Service. The next sentence is incorrect, mining is an appropriate multiple use on the Forest Service and Rosemont holds mineral rights so the development of the project is not inappropriate development. There has been no determination of degradation of water quality. The "disposal sites" are an integral part of the operations and are actually engineered facilities. The rest of the statement is hyperbole on the part of EPA and not specific or scientific analysis.
The Rosemont Mine Will Cause Unacceptable Adverse Effects to Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites and Similar Preserves. [180]	The title cited 40 CFR 230.54 does not apply to Rosemont. The fill activities are not taking place at any parks, national and historic monuments, national seashores, wilderness areas, research site, or similar preserve. Even though it does not apply, the Forest Service

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[180] See Guidelines, Subpart F (40 CFR 230.54)	chose the alternative that best suited the site to minimize adverse impacts, which is allowed in this section.
The Rosemont Mine would significantly degrade the following national and regional conservation lands. **Las Cienegas National Conservation Area.** BLM's Las Cienegas National Conservation Area (NCA) was established by Congress, in large part, to conserve, protect and enhance the unique and nationally important aquatic, wildlife, vegetation and riparian resources of the Cienega Creek watershed. Six types of rare ecosystems are protected within the NCA, including aquatic ecosystems such as cienegas (marshlands), cottonwood-willow riparian wetlands, and mesquite bosques. Because of its ecological significance, Congress and the President designated the NCA as part of BLM's National Landscape Conservation System. The National Landscape Conservation System was established to protect some of the most remarkable public lands in the American West. Additionally, a 10.5 mile stretch of Cienega Creek has been rated eligible for national wild and scenic river designation (BLM 2003).[181] [181] FEIS, p. 839.Reference	Rosemont disagrees with the statement regarding impacts to the sites listed. Reference 181, FEIS (pg. 839) does not support the statement made regarding the Las Cienegas NCA in the paragraph, although the information provided is correct.
At its nearest point, the mine site lies only 3 to 4 miles from the NCA boundary. The consequence of the groundwater drawdown from the mine pit is the secondary loss or conversion of hundreds of acres of riparian vegetation, including wetlands, and the drying of streams currently characterized by permanent flow. These impacts are permanent and persistent resulting in significant degradation and loss of rare and largely intact mosaics of some of the highest quality stream and wetland ecosystems in Arizona; adversely affecting federally listed endangered and threatened species[182,183] The proposed mine project will degrade and destroy the resources Congress sought to protect. [182] FEIS, Chapter 3, Seeps, Springs and Riparian Areas [183] Per the B.O., these species and/or their critical habitat include the: Chiricahua leopard frog, northern Mexican gartersnake, Gila chub, Gila topminnow, desert pupfish, Huachuca water umbel, yellow-billed cuckoo, and southwestern willow flycatcher	Reference 182 regarding the FEIS Chapter 3, Seeps, Springs and Riparian areas does not support the EPA language about the magnitude and temporal scope of the potential impacts. 'The cited portion of the FEIS substantiates that Cienega Creek supports threatened and endangered species, and acknowledges that Cienega Creek could be impacted. As noted earlier, the FEIS states "*A range of outcomes was assessed for Cienega Creek, all of which have high levels of uncertainty due to the long time frames, long distances, and small amounts of drawdown involved. The most likely scenario suggests that noticeable reductions in stream flow in Cienega Creek would not occur for hundreds of years after closure and, once occurring, would not result in widespread absence of flow along Cienega Creek.*" (FEIS pg. 689-690).
Pima County Cienega Creek Natural Preserve. Pima County has identified the Cienega Creek Natural Preserve as the "crown jewel" of their natural resource conservation lands.[184] The approximately 4,000-acre preserve was established in 1986 and contains some of the region's most significant aquatic and riparian habitat extending a length of 12 miles along Cienega Creek. Surrounded by the arid environment of the Sonoran Desert, the Cienega Creek riverine wetlands provide shelter and foraging habitat for wildlife species. Within the Preserve, portions of Cienega Creek run perennially providing habitat for federally listed as endangered, Gila topminnow, Gila chub, and the Huachuca water umbel. The Preserve also provides a corridor link for movement of larger wildlife between the Santa Rita, Whetstone and Rincon Mountain Ranges. [184] Brian Powell, Pima County Office of Sustainability and Conservation, Water Resource Trends in the Cienega Creek Natural Preserve, Pima County, Arizona dated August 2013.	The information regarding the preserve appears to be accurate.
The Preserve was established for the "purposes of preservation and protection of the natural scenic resources of the property…for the benefit and protection of the County, its resources, residents, and visitors."[185] Construction of the proposed Rosemont Mine through the filling of Cienega Creek's headwater streams, diversion of streamflow and groundwater drawdown will dramatically alter in perpetuity the surface and subsurface hydrology of the Cienega Creek watershed causing stress and degradation of aquatic habitat resulting in dramatic and persistent changes to the preserve. [185] Ibid.	The Rosemont project has not proposed to fill "Cienega Creek's headwater streams," as Cienega Creek's headwaters are defined as being above Gardner Canyon (FEIS, Table 106, pg. 491). Barrel Canyon is part of an ephemeral system that feeds Davidson Canyon and after approximately 15 miles ultimately discharges into Lower Cienega Creek approximately 2 miles above its confluence with Pantano Wash. Cienega Creek itself is approximately 23 miles long. Further, the mitigation proposed in the Habitat Mitigation and Monitoring Plan by Rosemont in 2017 will replace stormwater flows lost due to the project operations, and diversion of stream flow is designed to ensure water continues to flow into Barrel Canyon. As stated in reference 61, FEIS (pg. 554), "*The reduction in surface flow itself would likely have no impact to riparian vegetation or water quality; it could represent a reduction in recharge to the shallow alluvial aquifer and subflow from Davidson Canyon to Cienega Creek. The distance downstream of the project area (12 miles) that flows have to travel before reaching lower Davidson Canyon gives the*

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	predicted effect a high level of uncertainty, as recharge in lower Davidson Canyon is more likely to occur either from very large storm events or from more localized runoff events."
Bar V Ranch Preserve. Pima County's 14,400-acre Bar V Ranch Preserve is a located adjacent to the County's Cienega Creek Natural Preserve in the Cienega Creek watershed. It includes significant portions of Davidson Canyon. It is designated as Biological Core and Important Riparian Area within Pima County's Conservation Lands System, supporting habitat for 34 Priority Vulnerable Species identified in the Sonora Desert Conservation Plan and is a vital wildlife corridor link in Cienega Valley.[186] [186] http://www.sonorandesert.org/properties/barv/	Bar V Ranch is maintained as a working ranch and is not a preserve (see http://www.pima.gov/cmo/admin/reports/ConservationReport/PDF/Chapters/Reserves/Bar%20V%20Ranch.pdf, accessed January 15, 2018) so 40 CFR 230.54 does not apply.
Construction of the proposed Rosemont Mine through the filling of Cienega Creek's headwater streams, diversion of streamflow and groundwater drawdown will dramatically alter in perpetuity the surface and subsurface hydrology of the Cienega Creek watershed causing stress and degradation of aquatic habitat resulting in dramatic and persistent changes to the Bar V Ranch Preserve.	As stated above, the Rosemont project has not proposed to fill "Cienega Creek's headwater streams." Further, Bar V Ranch is located approximately 3 miles upgradient of Cienega Creek in Davidson Canyon (approximately 0.5 miles above the Davidson Canyon OAW) and contains a stock tank that is filled by diverting surface flows out of Davidson Canyon. Google Earth images at 31°58'13.32"N and 110°39'1.34"W currently show what appears to be a camper and off-road vehicles in the stock tank; however historical images show the diversion in place as late as 2012 with actual construction taking place while the pictures were being taken in about September 2006. Other infrastructure, such as wells, drinkers, septic systems, etc. for Bar V is also not included in the description. Again 40 CFR 230.54 does not apply.
Coronado National Forest. The Rosemont Mine would result in the direct removal of up to 6,990 acres (5.1 percent of NFS lands within the Santa Rita Ecosystem Management Area) from public entry.[187] The national forest is located within the Sky Island region of southeastern Arizona, southwestern New Mexico and northwestern Mexico. Elevations within the national forest range from 3000 feet to 10,720 feet in widely scattered mountain ranges or "sky islands." These mountain forested ranges separated by vast expanses of desert and grassland plains, are among the most diverse ecosystems in the world [188, 189] because of their great topographic complexity. [187] FEIS, p. 862 [188] www.fs.usda.gov/coronado [189] Skyislandalliance.org	The Coronado National Forest has a mandate for multiple uses and does not meet the definition of a preserve, a national park, wilderness area, or similar so 40 CFR 230.54 does not apply. While the statement about the impacts is correct, the statement referenced by 188 cannot be substantiated on the Forest Service website.
Construction of the Rosemont Mine would change the existing undeveloped, semi primitive recreation setting on lands surrounding the project area to a developed, industrialized setting.[190] Restricted public access due to the perimeter fence would result in a reduction of recreational activities with indirect effects such as increased noise, vibration, artificial lighting, traffic, loss of native vegetation and general industrial activities.[191] The mine would exclude hunters from access to approximately 4 to 5 percent of NFS lands resulting in the loss of 775 hunter days annually.[192] A 12.8 mile section of the Arizona National Scenic Trail would be relocated and increased traffic on the Patagonia-Sonoita Scenic Road will likely result in a reduction in use for cyclists and pedestrians.[193] [190] FEIS, p. 862. [191] Recreational activities include; birding, scenic touring, solitude, hunting, off-highway vehicle use, camping, hiking, horseback riding, and mountain biking. Restricted access would result in a direct loss of acres to the Santa Rita Backcountry Touring Area and National Forest roads. FEIS, p. 853 and p. 862. [192] FEIS, p. 853. [193] As many as 88 roundtrip truck traffic shipments would occur per day. FEIS, p. 856	The impacts as stated appear to be correct, but again 40 CFR 230.54 does not apply.
Outstanding National Resource Waters (ONRW). The State of Arizona has designated reaches of both Davidson Canyon and Cienega Creek as ONRWs due to, among other factors, their exceptional ecological and recreational significance and the presence of federally endangered and threatened species. This state designation affords them special protection, prohibiting any lowering of water quality. Federal regulations for state-designated outstanding waters similarly state "Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of	This statement appears to be correct.

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exceptional recreational or ecological significance, that water quality shall be maintained and protected" (40 CFR 131.12(a)(3)).	
The proposed mine will result in the lowering of water quality in the ONRW through: 1) heavy metal contamination; 2) increasing total sediment in surface water flow; and 3) alteration of the physical, chemical and biological integrity of the stream. These adverse water quality impacts to downstream ONRWs will be permanent.	The record for all of the reasons listed above does not substantiate the impacts as stated.
The Rosemont Mine Will Result in Unacceptable Adverse Cumulative Effects on the Aquatic Ecosystem.[194] [194]See Guidelines, Subpart B (40 CFR 230.11(g)).	Reference 194: CFR 230.11(g) addresses factual determinations regarding cumulative effects on aquatic ecosystems. It's unclear how this relates to EPA's section header here (i.e. whether it is simply meant to refer the reader to a pertinent component of the regulation, or whether it is meant to support EPA's assertion).
The USFS evaluated the cumulative effects on biological resources from the Rosemont Mine and concluded; *When considered together, these foreseeable actions, when combined with the expected impacts from the proposed project (no matter which action alternative is selected), and with climate change and human population growth and associated development, would cumulatively contribute to impacts such as loss of fragmentation of habitat, vibration, noise, dust and air pollutants, and artificial lighting. The overall result would be a continuation of the long-occurring trend of reduced habitat quantity, and quality; distribution of movement and genetic flow; and continued increase in risk and threat to sensitive species.*[195] [195] FEIS, p. 712.	The statement made is accurate, however it does not support the contention of the section. The statement is not specific to the "aquatic ecosystem" and is a statement made in general regarding all biological resources whether they are aquatic or terrestrial. In fact, in the list of cumulative impacts, hazardous fuels reduction planning, road decommissioning, beaver establishment, quarry expansion, grazing permits, powerlines, as well as introduction of aquatic species are all listed.
The USFS conclusion underscores the significance of the cumulative effects on the aquatic ecosystem attributable from the Rosemont Mine. In evaluating the cumulative impacts, one must consider the additive nature of the mine's effects on the Cienega Creek watershed, the effects of drought and climate change, as well as the environmental impacts from future mining in the Cienega Creek watershed. Cumulative impacts on the aquatic ecosystem include those associated with past, present, and reasonably foreseeable discharges to waters of the U.S. The cumulative impacts stemming from the Rosemont Mine alone, without even considering foreseeable impacts associated with other activities in the watershed, would be severely damaging to the aquatic ecosystem.	The statement underscores the impacts of the project when considered with cumulative effects impacts, but again it is not specific to the aquatic ecosystem.
Less than 1 percent of Arizona's landscape has wetlands. Since the late 1800's, streams and wetlands throughout Arizona have been modified or drained, resulting in the loss of more than one-third of the State's original wetlands.[196] The proposed project will contribute to the significant cumulative loss of wetlands in Arizona. At a regional level, changes in the aquatic ecosystem of the Cienega Creek watershed from the Rosemont Mine and other cumulative effects will result in a significant impairment of the water resources, including the productivity and water quality of existing aquatic ecosystems. [196] http://pubs.usgs.gov/wsp2425/state_highlights_summary.html	There is no impact to wetlands from the fill activity. The FEIS Table 103 (pg. 463) details the impacts to "Special Aquatic Sites" and the alternative chosen as the preferred alternative does not impact any special aquatic site. The Cienega Creek Watershed is not impacted by the fill activity.
Mining. The Rosemont Mine has a predicted life of 25-30 years. The cumulative effects of this mine are significant as impacts from reduce stormflow, reduced sediment delivery and contaminated mine runoff are additive and will persist long after mining has ceased. Metal contaminated sediments are sources of future contamination and pose ongoing long term risk to the environment.[197] This mine will cause wide and pervasive changes to the ecosystem through a reduction in the diversity and spatial distribution of waters over large geographic areas and will cause habitat fragmentation, water quality degradation and risk to federally listed endangered and threatened species. [197] Taylor and Hudson-Edwards. 2008.	The sentence associated with reference 197 contains language lifted nearly verbatim from Taylor & Hudson-Edwards (2008). Notably, EPA has removed qualifiers from this language. Here's the pertinent language from Taylor & Hudson-Edwards (2008), with the original qualifiers emphasized in bold: "*metal-contaminated sediment **may** act as major sources of future contamination and **may** pose an ongoing long-term risk to the environment*". The statements are not are not a specific factual determination of cumulative effects on the aquatic ecosystem. Based on the determination of the U.S. Fish and Wildlife Service in the Biological Opinion, the Arizona Department of Environmental Quality in the 401 Certification, and the Forest Service in the various FEIS sections quoted above, the EPA statement cannot be supported.
Rosemont Copper Company currently has three mineral deposits near the Rosemont Mine: Broad Top Butte, Copper World, and Peach-Elgin with potential mineral resources of 8.8 million tons for Broad Top Butte and 23.4 million tons for Peach-Elgin.[198] These deposits are located on the northwest corner of the	The statement regarding the mineral deposits and the potential for Rosemont to conduct further work is correct. Rosemont's parent company has a responsibility to its shareholders to manage company assets in a responsible manner. The economic and technical feasibility of extraction of these minerals, however, has not been analyzed. As such, development of these potential mineral deposits is

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proposed Rosemont Mine. It is Rosemont Copper Company's intention to conduct further work at these sites to evaluate the mineral potential, stating that these deposits have potential as satellite areas of production.[199] Mining of these areas would expand and prolong the significant degradation of the Cienega Creek watershed.[200] Additional mining would further deplete groundwater levels currently experiencing overdraft conditions threatening municipal and private water supplies. For example, extending the Rosemont Mine life alone from 20 to 25 years will require additional mine water supply pumping resulting in an additional drawdown of 7.5 to 17.5 feet.[201] [198] Rosemont Copper Project CWA Section 404(b)(1) Alternatives Analysis (SPL-2008-00816-MB) prepared by WestLand Resources dated September 2013 pp. 23-26. No information was available on size of mineral resource for Copper World. [199] Ibid. [200] Additional potential future mining has been identified in the FEIS including the Charles Seel leases and Andrada Mine in Davidson Canyon and the Twins Buttes Mine near Sahuarita (FEIS, p. 437). [201] FEIS, p. 336.	not reasonably certain to occur. Consequently, the inclusion of these potential activities in an analysis of potential effects of the project is speculative and thus inappropriate. In addition, two of the mentioned ore bodies are on the west side of the Santa Rita Mountains and would be hydrologically isolated from Cienega Creek. Moreover, the implication that extending the mine life would result in additional drawdown in the Cienega Creek basin is misleading; the statement referenced by the EPA is clearly included in the FEIS' analysis of groundwater drawdown on the west side of the Santa Rita Mountains, not the Cienega Creek watershed. The references to the potential quarries in Davidson Canyon and to Twin Buttes near Sahuarita are not properly referenced. The potential quarries in Davidson Canyon are in the FEIS (pg. 437) in the Section on Surface Water Quantity, however the discussion regarding Twin Buttes is located in the FEIS (pg. 356) in the Section on Groundwater Quantity. Both are listed as potential cumulative effects and are analyzed appropriately. Nowhere in the analysis can the statement "currently experiencing overdraft conditions threatening municipal and private water supplies" be supported. In fact for all of the reasons stated above, this is pure conjecture on the part of EPA.
Drought and Climate Change. The adverse effects of the project's changes to the regional hydrological regime would be further exacerbated by drought and projected climate change. The long-term trend in surface flows in Cienega Creek is one of steep, continuing decline due to several factors including increasing domestic groundwater pumping and persistent natural drought. Long-term ground and surface water monitoring within the Cienega Creek watershed indicates that the duration and extent of streamflow is very susceptible to drought; the length of stream segments that support perennial flow have been reduced beginning with the drought of the 1980s.[202] Between 1990 and 2011, surface water discharge in Cienega Creek declined 83%, while stream flow extent declined by 88 percent.[203] Davidson Canyon has also exhibited a drying trend.[204] Evaluation of baseline trends in temperature and precipitation in Tucson, Green Valley and Vale show a statistically significant trend toward lower precipitation, and a statistically significant relationship between reductions in stream flow, increases in temperature and decreases in dissolved oxygen.[205] [202] http://www.pagnet.org/tabid/912/default.aspx [203] Powell, B. F. 2013. Water resource trends in the Cienega Creek Natural Preserve, Pima County, Arizona. An unpublished report to the Pima County Flood Control District, Tucson, AZ. [204] FEIS, p. 420. [205] SIR, p. 50-53	The reference 202 is unclear what EPA is specifically pointing to on this website. The only obvious drought impacts are illustrated in the first graphic, which starts in 1999 (not the 1980s, per EPA). Because the unpublished report by Powell 2013 is not available to Rosemont, a further review of the information presented, at http://www.pagnet.org/Programs/SustainableEnvironment/Water/HydrologicResearch/CienegaCreekProjects/tabid/1012/Default.aspx has a discussion on drought findings, which more accurately express the issues at Cienega Creek. Namely, "*Cienega Creek experienced record breaking drought conditions in summer 2013. PAG conducts flow mapping in June in Davidson Canyon and Cienega Creek Outstanding Arizona Waters to determine the minimal length of flow in the during the driest part of the year, coordinated with other river mapping efforts across the region. The perennial flow extent was found to be a record low of 0.93 miles in June 2013. This is 25% lower over one year. The June 2013 flow is 10% of the flow extent compared to the wet years in the mid 1980s when fully 9.5 miles flowed in Preserve during the dry season. PAG's hydrologic monitoring at Cienega Creek reveals that drought impacts have been noticeable since 2002. Although the creek saw some recovery in 2006-2008, the drought has since become more severe. Each June since 2011, the record low flow miles are recorded. Current groundwater levels also remain significantly below pre-drought levels.*" The Forest Service evaluated drought effects in the analysis presented in the FEIS so it is unclear what this section is presenting, however the language used by EPA is inflammatory and not supported by the reports presented. None of the climate effects shown are the result of actions by Rosemont.
Climate change research and modeling predict a 10-20 percent reduction in precipitation in the desert southwest within the next 75 years, resulting in more arid conditions.[206] Changes in rainfall and runoff will result not only in increasing dryness, but also more frequent flood events. Change in storm intensity is particularly significant in areas containing erodible metal-bearing sediment increasing the flux of metals from alluvial storage further degrading downstream aquatic resources.[207,208] [206] Letter from Pima County to US Army Corps of Engineers, RE: SPL-2008-00816 Rosemont Mine, dated January 19, 2012. [207] Longfield, S.A., Macklin, M.G. 2008. The influence of recent environmental change on flooding and sediment fluxes in Yorkshire Ouse basin. Hydrological Processes 13:1050-1066. [208] Walsh, K., Cai, W., Hennessy, K., Jones, R., McInnes, K., Nguyen, K., Page, C., Whetton, P., 2002. Climate Change in Queensland under Enhanced Greenhouse Conditions, CSIRO, Australia, 83 pp. cited in Taylor and Hudson-Edwards. 2008	SIR (pg. 18) issued by the Forest Service in 2015, states "*The Council on Environmental Quality (CEQ) has issued draft guidance on Consideration of Greenhouse Gas Emissions and the Effect of Climate Change in NEPA Reviews (Council on Environmental Quality 2014). This draft guidance is intended to help explain how agencies of the Federal Government should analyze the environmental effects of greenhouse gas (GHG) emissions and climate change when they describe the environmental effects of a proposed agency action. A review of the draft guidance indicates that the FEIS analysis of climate change meets the guidance provided by CEQ. The draft guidance does not constitute new information that would result in any changes to the analysis or conclusion of impacts disclosed in the FEIS.*" It is clear that in both the FEIS and the Amended BO, climate change was evaluated and acknowledged during the analysis. It is unclear of the rationale for including older references from areas not associated with the United States rather than using the guidance specified by CEQ even though that guidance has since been withdrawn.
The USFS states predicted changes in weather patterns could influence the quantity of stormwater that is stored at the surface and available for beneficial use by riparian vegetation. Increased temperatures and reduced precipitation will increase the vulnerability of springs and riparian systems relying on the	The FEIS (pg. 565) also states, "*climate change in the desert Southwest is predicted to bring about higher mean annual temperatures over the next 100 years, along with less winter precipitation, an increase in extreme rainstorms and flooding, and longer periods of drought. The extent to which these predictions will occur is uncertain, and the overall difference in the amount of annual precipitation is*

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groundwater system whether regional or local.[209] The potential cumulative effect of drought, aridity from climate change, and projected reductions in surface water flows and groundwater drawdown attributable to the Rosemont Mine proposed will result in significant adverse impacts to the aquatic environment. [209] FEIS, p. 565-566.	*impossible to accurately quantify.*" This acknowledgement in the uncertainty of the predictions is not brought forward in EPA's comments. In the FEIS (pg. 505), the Forest Service discusses the EPA concerns and states, "*Significant disagreement about the severity of impacts that could occur to perennial and intermittent streams has arisen, notably from EPA, BLM, and Pima County. In general, this disagreement has centered on two factors: the application of the groundwater models to predict impacts on distant perennial and intermittent streams, and the consideration of exacerbating factors like drought, climate change, and seasonality.*" A few sentences later, the discussion centers on the significant uncertainty regarding the accuracy of the groundwater models to predict impacts to riparian areas outside of a 5-foot drawdown contour. EPA's discussion regarding effects to the aquatic environment is part of this scientific disagreement and well outside the five-foot contour discussed.
The Mitigation Proposed by the Rosemont Mine Will Not Offset Impacts to Waters of the U.S. Below the Level of Significant Degradation.	The header is unclear. EPA has not specified which mitigation they are discussing. The HMMP discussed throughout this section was developed specifically to provide the required compensatory mitigation described by the 2008 Mitigation Rule. Other mitigation of habitat, water quantity, water quality, aquatic resource replacement, etc. is addressed in the FEIS in Appendix B and in the Biological Opinion. The EPA has ignored this additional mitigation as well as the work that was performed to ensure avoidance for the impacted resources.
The Rosemont Copper Company's compensatory mitigation plan, *Final Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB Rosemont Copper Project Revised September 12, 2017* (HMMP), does not prevent or replace the impacts that give rise to the significant degradation finding.[210] [210] See *EPA Analysis of the Final Habitat Mitigation and Monitoring Plan Permit NO. SPL-2008-00816-MB Rosemont Copper Project. September 12, 2017* dated November 30, 2017.	Rosemont has responded in full to the comments provided by the EPA under separate cover to the Corps of Engineers. Rosemont has not proposed mitigation to prevent or replace the impacts to waters of the United States but instead are providing compensatory mitigation as required in the 2008 Mitigation Rule which states, "*Compensatory mitigation involves actions taken to offset unavoidable adverse impacts to wetlands, streams and other aquatic resources authorized by Clean Water Act section 404 permits and other Department of the Army (DA) permits*." Compensatory mitigation is carried out through four methods: restoration of a previously existing aquatic site, enhancement of an existing aquatic site's functions, establishment of a new aquatic site, or preservation of an existing aquatic site. The mitigation proposed by Rosemont does not attempt to prevent or replace impacts but instead provide the required compensation as per the Corps rules.
For compensatory mitigation to bring a project into compliance with the significant test of the Guidelines, it must satisfy two conditions: it must prevent or replace the impacts that give rise to the significant degradation finding, and it must provide reasonable assurance of success. Without a reasonable assurance that the mitigation will function as intended, it cannot be fairly relied upon to reach a finding that otherwise significant adverse impacts would no longer be so.	EPA's statement regarding the first condition, does not match the Corps rules (40 CFR 230.91(c)(3) or the South Pacific Division (SPD) Regional Compensatory Mitigation and Monitoring Guidelines (2015). The preamble to the 2008 mitigation rule specifically states, "*Compensatory mitigation involves actions taken to offset unavoidable adverse impacts to wetlands, streams and other aquatic resources authorized by Clean Water Act section 404 permits and other Department of the Army (DA) permits.*" Mitigation is clearly not meant to prevent or replace impacts but instead to provide an offset for those impacts. Mitigation is touted in the next sentence, "*As such, compensatory mitigation is a critical tool in helping the federal government to meet the longstanding national goal of "no net loss" of wetland acreage and function.*" In the SPD Guidelines that same language is quoted in the second paragraph of the introduction. The second condition quoted - reasonable assurance of success - was addressed on page 19612 of the Federal Register notice for the mitigation rule. The Corps determined that in order to ensure successful completion of mitigation, financial assurance was necessary. The notice said, "*Therefore, the rule states that the district engineer shall require sufficient financial assurances to ensure a high level of confidence that the compensatory mitigation project will be successfully completed, in accordance with applicable performance standards.*" Rosemont assumes that the Corps will require the appropriate monitoring and reporting as well as financial assurance so that there is a "reasonable assurance of success."
The environmental scale of the HMMP plan is not commensurate with the environmental scale of its project impacts. What is lacking is a clear nexus between the impacts of the project and the proposed mitigation. The mitigation, located outside of the watershed where the impacts occur, cannot offset significant degradation within the Cienega Creek watershed itself or account for the loss of ecological services arising from the interrelationship of the headwater streams and the surrounding terrestrial ecology at a regional scale. In fact, the HMMP effectually reduces the diversity of ecosystem types and results in a loss of hydrologic function and the biological communities the ecosystem supports.	The direct discussion of EPA's comments on the HMMP address many of the statements made here. In addition, the SPD Guidelines on compensatory mitigation and monitoring specifically address projects outside of the watershed requiring a ratio adjustment to account for projects that are not within the watershed. Further, 40 CFR 332.2 defines watershed as, "*Watershed* means a land area that drains to a common waterway, such as a stream, lake, estuary, wetland, or ultimately the ocean." The mitigation project proposed by Rosemont ultimately drains to the Santa Cruz river upstream of where the project impacts lie. While the 2008 mitigation rule, in a discussion about watersheds states on page 19625 of the Federal Register notice, "*District engineers will determine appropriate watershed scales for compensatory mitigation projects, including services areas for mitigation banks and in-lieu fee programs. We do not believe it would be appropriate to identify specific watersheds in which compensatory mitigation can be conducted.*" Rosemont believes this statement illustrates the flexibility intended in the 2008 mitigation rule. Further, the 2008 mitigation rule uses the term flexibility numerous times to describe the intent of the rule. One such comment on page 19627 of the Federal Register reads, "We have substantially revised and reorganized this section of the final rule, and have provided flexibility for district engineers to make compensatory mitigation decisions based on what is environmentally preferable and is most likely to successfully provide the required compensatory mitigation." EPA's comments lose this basic premise.

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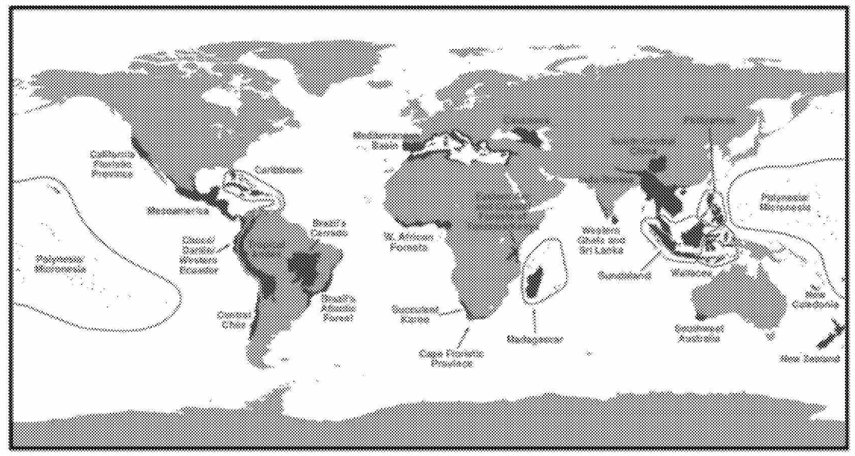
There is high risk and uncertainty associated with the proposed mitigation. The mitigation proposed at Sonoita Creek Ranch involves significant and risky hydrologic modifications and long term maintenance, thereby posing an extremely high risk of failure.[211] The proposed engineered channels are not designed as self-sustaining, unconstrained or naturally functioning floodplain channels, so they will not provide significant and lasting ecological benefits to the aquatic ecosystem. Highly questionable modeled predictions put the ecological benefits of the proposed constructed channels in question. As designed, it is highly questionable whether these constructed channels will flow at a frequency and duration sufficient to offset many of the stream functions directly and indirectly lost at the proposed mine site.[212] In addition, the proposed mitigation itself will result in the filling of 8.9 acres of Sonoita Creek. [211] Technical Memorandum on the Conceptual Design for Sonoita Creek, AZ from Dr. Mathias Kondolf, UC Berkeley and James Ashby, PG Environmental to Dr. Robert Leidy, USEPA dated February 18, 2015. [212] In a Corps Memorandum to the Field dated October 29. 2003, the Corps provides compensatory mitigation guidance as part of the implementation of the National Wetlands Mitigation Action Plan. The purpose of the Guidelines is to identify the basic requirements for mitigation success and to assist in mitigation site selection. This guidance identifies: 1) restoration over creation; 2) avoiding over-engineered structures in the wetland's designs; 3) restoring or developing naturally variable hydrologic conditions; 4) considering the hydrogeomorphic and ecological landscape and climate; and 5) attention to subsurface conditions, including soil and sediment geochemistry and physics, all of which the RM mitigation plan fails to do.	The discussion referenced in 211 is on a prior design that was changed based on the concerns raised in this very document. While the cited document acknowledges a risk of failure, the "extremely high" language used by EPA overstates the original concern. The pertinent language from the cited document: "*Even if the proposed constructed channels function as expected during frequent, small floods (e.g., occurring every year or two), they are likely to fail or alter significantly during larger floods (e.g., occurring on a decadal scale).*" The issues that were raised in the memo were addressed in the subsequent design document and are no longer relevant. The mitigation plan addresses the concerns directly. Rosemont disagrees with the assertions made by EPA, the level of technical evaluation performed on the mitigation plan for Sonoita Creek supports the design. Specific responses to the technical concerns raised by EPA are included in the response to the HMMP, which has been submitted under separate cover. The mitigation plan results in filling 8.9 acres of a highly manipulated system in favor of a more natural flowing channel system, the 8.9 acres is acknowledged and has been mitigated for in the plan. Rosemont is unable to find reference 212 cited here so it is unclear how the document supports the statements made. Also, the footnote ends with an unsupported assertion by EPA, which does not appear to be part of the October 2003 document as Rosemont's application was not submitted until after 2009.
EPA has reviewed the *Final Habitat Mitigation and Monitoring Plan Permit NO. SPL-2008-00816-MB Rosemont Copper Project dated September 12, 2017* (HMMP). The mitigation proposed in the final HMMP includes two components: the Sonoita Creek Ranch (SCR) project and the onsite stock tank removal. Rosemont submitted the mitigation package to compensate for impacts to waters of the United States by the proposed Rosemont Copper Mine. EPA comments on this HMMP are reviewed in an analysis dated November 30, 2017.	Rosemont has responded directly to the EPA comments on the HMMP under separate cover.
Our review of the HMMP affirms our position that the mitigation does not comply with EPA's 404(b)(1) Guidelines and the requirements of the Mitigation Rule. The HMMP proposed by Rosemont fails to offset the proposed mine's impacts to aquatic resources in the Cienega Creek watershed: • The SCR mitigation does not offset any of the pervasive damage to aquatic resources in the Cienega Creek watershed; • Rosemont's qualitative methodology comparing functional loss associated with the mine's impact site and the functional gain at the mitigation sites is scientifically flawed and unsupportable and therefore, not valid; • Rosemont's application of the mitigation terminology to the HMMP erroneously inflates the credit value of the mitigation; • The onsite stock tank removal relies on erroneous assumptions on stormflow, is not scientifically valid and fails to offset 28.4 acres of secondary impact to Cienega Creek and its' downstream Outstanding Arizona Waters; and • The Lower San Pedro In-Lieu Fee Project Site has not been approved by the Interagency Review Team and would not compensate impacts at the remote mine site.	Specific responses to the EPA review of the HMMP are available under separate cover. However specific to these five points: • Both SCR and Cienega lie within the Santa Cruz watershed and flow reductions to Cienega Creek are offset by the flow mitigation component proposed, this is addressed in the HMMP response at page 6 • The SPD mitigation ratio setting checklist requires a qualitative comparison because no Corps-approved quantitative functional assessment is available, this is addressed in the HMMP response at pages 6 and 7 • Rosemont simply disagrees with EPA's assertion and addresses this terminology statement fully in the response to HMMP comments at pages 1 to 6 • The SPD of the Corps has chosen to review the stormflow losses as a direct comparison rather than the calculated "secondary impact calculation." Additional discussion of this issue is contained in the HMMP response, pages 38 to 47 • The Lower San Pedro ILF has already begun selling advance credits so this assertion by EPA appears to be in error, the ILF is addressed in the HMMP response at page 48
Conclusions and Basis for Finding of Significant Degradation	
The Rosemont Mine will degrade and destroy waters in the Cienega Creek watershed containing regionally rare, largely intact mosaics of some of the highest quality stream and wetland ecosystems in Arizona. These environmental consequences are substantial and unacceptable and contrary to the goals of the CWA. Mitigation proposed by Rosemont Copper Company will not prevent unacceptable adverse effects to these waters from the proposed mine. Therefore, EPA Region IX maintains that impacts associated with this project will result in significant degradation (40 CFR 230.10(c)) of our Nation's waters.[213]	The Draft Record of Decision does not support this conclusory statement, which is a statement within the decision space by Mr. Upchurch to discuss in general the restrictions on his decision space. A similar statement is made by Mr. Dewberry in the Final Record of decision. However, this is not a statement as to the impact on aquatic resources as implied by EPA and as required under 40 CFR 230.10(c). Both statements refer to the FEIS and the preferred alternative that "*best achieves the minimization of impacts to the Forest Service surface resources while allowing mineral operations and all uses reasonably incident thereto.*" (see page 14 Final ROD) Rosemont has addressed the specific assertions made by EPA throughout this document. The waters that will be directly impacted are ephemeral streams that are nearly 15 miles upstream from Lower Cienega Creek and while the Rosemont site sits within the Cienega

EPA Comment	Rosemont Response
[213] Jim Upchurch, Forest Supervisor, Coronado National Forest, stated in the Draft Record of Decision for the FEIS, *I recognize that each of the action alternatives would result in significant environmental and social impacts and that the no action alternative is the environmentally preferable alternative…* (p. 11).	Creek Basin, the area encompassed by the project is less than 14 square miles while the basin in 457 square miles. There are no special aquatic sites and the total waters impacted at the site are 40 acres (0.0625 square miles).
The environmentally-damaging nature of the Rosemont Mine (*i.e.,* large-scale, long-lasting, extractive mineral mine) will cause or contribute to significant persistent degradation of the aquatic environment. As a direct consequence of the § 404 CWA permit action, direct and secondary impacts from the proposed project will result in the loss, conversion and functional habitat degradation/destruction of aquatic, wetland and terrestrial habitats supporting 12 federally listed endangered or threatened species. This region includes vast areas of the Coronado National Forest, the Las Cienegas National Conservation Area, Pima County preservation areas and state-designate ONRWs recognized as being of regional and national importance.	The assertions regarding preserves and conservation areas are discussed above and the specific comments on drawdown impacts are addressed in a separate response document. Rosemont believes that EPA's assertion of significant degradation has not been proved per the requirements of 40 CFR 230.
EPA has determined the Rosemont Mine will result in the following effects which individually and cumulatively contribute or cause significant degradation: 1) Significantly adverse effects of the discharge of pollutants on human health or welfare, including but not limited to effects on municipal water supplies, plankton, fish, wildlife and special aquatic sites; 2) Significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems, including the transfer, concentration, and spread of pollutants or their byproducts outside of the disposal site through biological, physical and chemical processes; 3) Significantly adverse effects of the discharge of pollutants on aquatic ecosystem diversity, productivity, and stability; and 4) Significantly adverse effects of the discharge of pollutants on recreational, aesthetic, and economic values.	Rosemont disagrees with the assertions and has addressed them specifically above, however as to the four points specifically listed: 1) The fill activity will not affect municipal water supplies and the system being filled is ephemeral, there are no plankton, fish or special aquatic sites 2) The fill activity has been certified by the State of Arizona through the 401 Certification process to have no effect on waters and there are no perennial waters on site so there will be no effect to wildlife dependent upon aquatic ecosystems 3) The fill activity has been determined to have no effect on the aquatic ecosystem; and 4) The fill activity may affect the viewsheds in the forest but significant mitigation have addressed the potential for and effect on recreation or economics
APPENDIX A **Project Description and Environmental Setting and Significance**	
Project Description The Rosemont Copper Company proposes to develop the Rosemont Mine within the Cienega Creek watershed in Pima County, AZ, approximately 30 miles south of the city of Tucson. The mine would occupy ~4,750 acres of National Forest Service, Bureau of Land Management and some privately-owned lands, with the primary land holding being Coronado National Forest. The mine is projected to produce ~4.7 billion pounds of copper, 90 million pounds of molybdenum and 54 million pounds of silver over the proposed 25-30-year mine life. Mining will be conducted using conventional open-pit techniques. The mine pit would measure between 6,000 – 6,500 feet in diameter, with a final depth of 1,800-2,000 feet. The mine would produce a total of approximately 550 million tons of ore and 1,288 million tons of waste rock. Waste rock will be blasted and transported by haul truck to a storage area. Ore will be blasted, crushed and loaded onto a conveyor for conventional sulfide milling (sulfide ore). Tailings will be stored using a dry stack tailings technique. The placement of waste rock will include perimeter buttresses, with placement of the perimeter of the dry stack tailings storage areas to provide structural and erosional stability of the tailings pile. The copper concentrate from the milling operations will be shipped off site to a smelter. The proposed project includes a 950-acre mine pit, 1,460-acre waste rock storage areas, 987 acre dry-stack tailings facility, ancillary facilities and structures, access and haul roads, and off site water and power and transmission lines.[214]	EPA references the proposed action and should more specifically reference the Preferred Alternative (Selected Action) in the Final Record of Decision pages A-1 through A-23. The areas of land impacted by the chosen alternative are listed on page vii of FEIS Volume 1: 995 acres of private (Rosemont) land, 3,670 acres of Forest Service lands, and 75 acres of Arizona State Land Department Lands. The chosen alternative does not impact BLM lands. Mining will be conducted using open-pit techniques and the pit size is approximately 6,500 feet in diameter, the final depth is 3050 feet above mean sea level and depth is dependent upon the elevation of land surface. The mine will produce approximately 661 million tons of sulfide material and 1,249 million tons of waste rock. Placement details are correct. The pit sizing will be approximately 955 acres, while the waste rock and tailings facility sizes are not specified in either the FEIS or the Record of Decision.

EPA Comment	Rosemont Response
[214] For more detailed description of the proposed mine, see FEIS, Volume 1.	
Environmental Setting and Significance We considered several additional environmental factors in our evaluation of the significance of the aquatic resources that will be impacted by the Rosemont Mine. These include the landscape setting, quality and rarity of the aquatic resources that will be impacted, and the severity, permanence and persistence of project impacts. These considerations include the status of the aquatic resources as Aquatic Resources of National Importance (ARNI) and Special Aquatic Sites.	
Geographic Scope-Landscape Setting. Essential to evaluation of the environmental effects of the Rosemont Mine is the geographic scope, or landscape setting, of the project within the Cienega Creek watershed.[215] The proposed Rosemont Mine lies on the eastern slopes of the Santa Rita Mountains and is bisected by an intricate network of 154 individual ephemeral and intermittent drainages that encompass over 18 linear stream miles. The mine footprint would cover 13% of the uppermost Barrel/Davidson Canyon watershed where annual precipitation ranges between 13-23 inches, amounts of rainfall comparable to more mesic regions near San Francisco, California.[216] At the proposed mine site the stream network functions as an important headwater source area for stormwater runoff and mountain-front recharge. Significantly, water falling as precipitation at the mine site is directly linked through surface and subsurface hydrologic pathways to surface flows in nearby downstream waters. In addition to serving as a water source area for streams and wetlands, and their associated fish and wildlife, the site contributes a significant amount of water to municipal and residential users' water through surface and sub-surface hydrologic pathways. The ecological significance of this setting is best understood from a landscape-scale, hydrologic accounting unit perspective. As such, the sites' water yielding drainages and groundwater aquifers distribute water through interconnected surface and subsurface pathways to support the functioning of down-gradient streams, riparian forests, springs, seeps, wetlands and human users. The persistence and health of aquatic resources associated with Cienega Creek and its major tributaries of Barrel Canyon, Davidson Canyon, Empire Gulch, and Gardner Canyon are dependent on contributions of abundant and clean surface water originating as overland and stream flow from the proposed mine site. [215] *The Corps will fully consider comments regarding the site from watershed or landscape scale, including an evaluation of potential cumulative and secondary impacts*. Regulatory Guidance Letter 92-01 [216] FEIS, Table 31	The FEIS evaluation within a landscape or geographic setting while appropriate, may in fact be too limited. In consideration of Waters of the United States within the basin, EPA's review should include an overall evaluation of the Santa Cruz basin and all waters feeding the TNW reach not a subset of a drainage basin. FEIS Table 99 is the citation for the 154 individual drainages, all ephemeral, which includes the entire project site or 9,135 acres encompassing all possible alternatives considered by the Forest. The total acres of waters that these 154 drainages encompass are 101.6 acres, only a subset of that area, 40.4 acres encompasses the project site. The entire footprint of the site is 4,454 acres (Final ROD, pg. A-23) or 6.95 square miles of Barrel Canyon, which is approximately 46% of the Barrel Drainage. The project footprint does accounts for approximately 13.5% of the Davidson Canyon drainage area. Annual precipitation per the FEIS (pg. 236) is as stated by the EPA. However there is no reference provided for the assertion that rainfall is comparable to mesic regions near San Francisco (initial review of U.S. Climate Data indicates it exceeds this range at an average annual rainfall of 23.64 inches). The relevance of EPA's comparison of rainfall in San Francisco to Barrel/Davidson Canyon is unclear. Even if the rainfall was comparable, this statement deliberately obscures the fact that the Barrel/Davidson Canyon precipitation data range is comparable to other mountain ranges in the region (e.g. Mt. Lemmon avg annual precip = 30.0 inches [https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az5733]), as overlaps with the rainfall for the Sonoran Desert, which ranges from 3-20 inches/year (https://www.nps.gov/im/sodn/ecosystems.htm). Further, the climate in terms of humidity, temperature, solar radiation, evaporation, etc. is different when comparing San Francisco and Barrel/Davidson Canyon making the comment made that much more puzzling.
Quality of Resource – Ecological Health. The Cienega Creek watershed is the most intact natural major valley bottom aquatic wetland ecosystem in Arizona.[217] It is an aquatic resource of conservation value exceeding or equal to any other in the American Southwest. The aquatic ecosystem of the Cienega Creek watershed functions as the lifeblood that sustains a near pristine landscape rich in biodiversity. The mine site lies within the Madrean sky islands which is part of the Madrean pine-oak woodlands ecoregion; an internationally recognized biodiversity hotspot featuring significant levels of biodiversity that is under threat from humans.[218] Several major drainages occur within the project assessment area: Wasp, McCleary, Scholefield, Barrel, and Box canyons; Empire Gulch; Gardner Canyon; and Ciengea Creek. Scholefield, Wasp and McCleary canyons drain to Barrel Canyon which joins Davidson Canyon approximately 4 miles east of the site. The site also supports ninety-five seeps and springs that are critical to the survival of many wildlife species. Almost all the drainages support xero-, meso-, or hydroriparian riparian habitats. Empire Gulch, Gardner Canyon, and Cienega Creek contain perennial stream reaches and support hundreds of acres of high quality riparian and palustrine emergent wetlands, many of which would qualify as jurisdictional waters. [217] Rosen, P.C. and D.J. Caldwell. 2004. Aquatic and Riparian Herpetofauna of Las Cienegas national Conservation Area, Empire-Cienega Ranch, Pima County, Arizona. Prepared for Bureau of Land Management, Tucson Office, September 1, 2004. [218] Myers, N., Mittermeier, R.A. Mittermeier, C.G., Gustavo, A., da Fonseca, B., and J. Kent. 2000.	The statements made using reference 217 are questionable. It appears that EPA made an incorrect translation of the paper, which states the watershed supports a wetland, not that it is a wetland. The other issue is that the reference source itself does not provide a source for its assertion. If you review the National Wetland Inventory (https://www.fws.gov/wetlands/data/Mapper.html) and ADEQ's 2012 state-wide wetland mapping (https://www.fws.gov/wetlands/Data/SupMapInf/R02Y12P04.pdf) effort, these documents indicate there are a number of larger wetland areas in Arizona. There are so many qualifiers strung together to indicate this is a unique feature that it raises questions on what EPA is attempting to convey. Given the statements provided by the EPA, then the statement that it is an "aquatic resource of conservation value exceeding or equal to any other in the American Southwest" is misleading at best. It is also misleading for the EPA to qualify the entire watershed as a "near pristine landscape." Rosemont has previously provided the Corps (December 6, 2016) with documents illustrating the various mining landscapes within the watershed and the FEIS has a number of connected actions that have been evaluated during the EIS process including quarries (FEIS, pg. 437) within the drainage. The FEIS (pg. 420) documents a steady decrease in flows in Lower Cienega Creek. Further, Pima County has documented changes to Cienega Creek the cause of which, they identify as pumping (FEIS Record 048832, pg. 34, *Water Resource Trends in the Cienega Creek Natural Preserve, Pima County, Arizona,* August 2013, Brian Powell). Reference 218 does not list Madrean pine-oak woodlands as an ecoregion, and the two closest ecoregions (California Floristic Province and Mesoamerica) do not intersect the project area whatsoever.

EPA Comment	Rosemont Response
Biodiversity hotspots for conservation priorities. Nature 403: 853-858.	 **Figure 1** The 25 hotspots. The hotspot regionses comprise 30–3% of the red areas.
Special aquatic sites **-**Three of the six Special Aquatic Site types described in Subpart E of the Guidelines occur on or adjacent to the proposed project. Because of their special ecological characteristics of high food-web productivity, physical habitat critical for all life stages of aquatic life, water quality functions, and other important and easily disrupted ecological functions, these aquatic resources are given special recognition under CWA regulations. Collectively, the Special Aquatic Sites in the project area play a regionally significant role in maintaining the existing, high quality functions and services in this watershed. The project will adversely affect three types of "Special Aquatic Sites" including wetlands, sanctuaries and refuges, and riffle and pool complexes (40 CFR 230.40 – 45)), as well as Tier 3 "unique" waters (portions of Davidson Canyon and Cienega Creek that are designated by the State of Arizona as ONRWs). These aquatic resources and adjoining habitat support ten federally listed endangered or threatened species. Sanctuaries and refuges are areas designated under state and federal laws or local ordinances to be managed principally for the preservation and use of fish and wildlife resources.[219] Portions of lower Davison Canyon and Cienega Creek are designated by the State of Arizona as ONRWs (see discussion, below) and are within the Cienega Creek Natural Preserve (CCNP), a 4,000 acre sanctuary along 12 stream miles noted for its ecological significance and natural beauty as a desert riparian oasis.[220] In addition, portions of Empire Gulch lie within the Las Cienegas National Conservation Area (LCNCA), administered by BLM, a 45,000 acre preserve set aside in large part to protect riparian wetlands and native aquatic organisms including endangered fish and amphibians. Wetlands and riffle-pool complexes are also Special Aquatic Sites that will be affected directly through the discharge of fill material at the mine site and by the secondary effects of reductions in surface water, changes in sediment delivery, and groundwater drawdown from the proposed project.[221] Riffle and pool complexes are especially valuable as habitat for fish and wildlife, supporting important feeding, spawning, rearing, and refuge functions for aquatic and life-cycle dependent terrestrial species. [219] See Guidelines, Subpart E (40 CFR 230.40).	There are no special aquatic sites located on the proposed project area (FEIS pg. 463 Table 103). The standard for special aquatic sites does not extend to "adjacent areas." Restrictions on discharge at 40 CFR 230.10(a)(3) specifically discusses the considerations for special aquatic sites. It states, " *Where the activity associated with a discharge which is proposed for a special aquatic site (as defined in subpart E) does not require access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose (i.e., is not "water dependent"), practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise. In addition, where a discharge is proposed for a special aquatic site, all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise.*" [emphasis added] As stated before, the fill activities will not affect downstream Outstanding Arizona Waters, per ADEQ's 401 Certification. According to the US FWS Amended Final Reinitiated BO dated April 28, 2016, there are three fish species, one frog, one snake, two cats, two birds, a bat, a water umble and a cactus (12 species not the 10 EPA lists) that may be affected (and likely adversely affected) by the project. Only six of these species are aquatic species, and only one (the frog) has been found in proximity to the fill activity. The adjoining habitat cited by EPA is Davidson Canyon OAW which is 12 miles away, Lower Cienega Creek which is 14 miles away or Empire Gulch a tributary to Upper Cienega Creek which is approximately 5 miles or Upper Cienega Creek itself which is approximately 7 miles from the nearest fill activity. The Davidson Canyon OAW, in the CCNP, is 12 miles away and while portions of the LCNCA are approximately 3 miles away the aquatic features are approximately 5 miles away at Empire Gulch. There are no wetlands that will be affected on-site; the one wetland that may have been affected was not chosen in the alternatives selection. As described above, riffle and pool complexes do not occur in the ephemeral wash system at the Project site. While some pools may persist for very short periods of time, these features do not rise to the definition of riffle and pool complexes as contemplated in regulation.

EPA Comment	Rosemont Response
[220] http://rfcd.pima.gov/wrd/landmgt/cienegapreserve/ [221] Wetlands are defined at 40 CFR § 230.41. Riffle-pool complexes are defined at 40 CFR § 230.45	
Outstanding Arizona Waters. The state of Arizona has designated reaches of both Davidson Canyon and Cienega Creek as ONRWs due to, among other factors, their exceptional ecological and recreational significance and the presence of federally threatened or endangered species.[222] Davidson Canyon Wash is a rare, spring-fed, low elevation desert stream, supporting a variety of uncommon flora and fauna. Cienega Creek contributes flows to the Santa Cruz River via Pantano Wash, and contains remnants of a historically extensive cienega system, defined by springs and marsh areas supporting habitat for wildlife and plant species, included threatened and endangered species. As ONRWs, their water quality meets or exceeds applicable water quality standards and lowering of water quality is prohibited. [222] There are only 22 OAWs in the state of Arizona. http://www.azdeq.gov/environ/water/permits/download/oaw.pdf	EPA's reference does not support the designation of Davidson Canyon or Cienega Creek. While Cienega Creek may provide habitat for threatened or endangered species, Davidson Canyon does not list that distinction in its nomination. The cienega system defined by springs and marsh areas is discussed in the FEIS Record 048832 (pg. 34), *Water Resource Trends in the Cienega Creek Natural Preserve, Pima County, Arizona,* August 2013, Brian Powell where he documents that these areas no longer exist and in fact downcutting has become a real problem. ADEQ has stated that Rosemont will have no effect (will not degrade) the water quality in Davidson Canyon (see pg. 4 of the Final Fact Sheet from ADEQ for the 401 Certification dated February 3, 2015).
Aquatic Resources of National Importance. The EPA has determined that Cienega Creek and its major tributary, Davidson Canyon Wash, are aquatic resources of national importance for the purposes of Part IV of the August 1992 Memorandum of Agreement between the EPA and the Department of the Army regarding Section 404(q) of the Clean Water Act. These aquatic resources are extraordinary, rare and intact ecosystems in a desert environment, and their protection is an explicit priority of local, state and federal agencies, environmental organizations, and the public.[223] [223] See EPA 3(a) and 3(b) letters to the Corps dated January 5, 2012 and February 13, 2012.	EPA did send the 3a and 3b letters to the Corps. However, upon closer inspection, the letters are based not on fact but appear to be letters that were produced with little analysis using information that may be inaccurate. For instance, the 3b letter lists canoeing as one of the lost recreational opportunities.
Important riparian areas. In December 2001, Pima County incorporated the Sonoran Desert Conservation Plan into its comprehensive land use plan by establishing the Conservation Lands System as the regional environmental vision. This system classifies lands into a variety of designations to reflect their relative value and importance in maintaining the biological diversity of Pima County. Davidson Canyon is identified under the plan as Biological Core area, and, along with Cienega Creek, an Important Riparian Area. By connecting the Empire, Santa Rita, and Rincon Mountain ranges—a network identified by the Arizona Department of Game and Fish, BLM and Pima County as critical wildlife movement corridor-Davidson Canyon, Cienega Creek and other riparian areas provide a natural habitat mosaic for the wide dispersal and migration of many species (*e.g.,* black bear, mountain lions, bobcats, coyotes).[224] [224] DEIS, p. 370	The fill activity will not impact Davidson Canyon and while the Conservation Lands System is a regional environmental vision, it has no impact over the Federal, State or Private Lands within the classifications. Additionally, Stating that "Davidson Canyon is identified under the plan as a Biological Core area" is a misrepresentation. Davidson Canyon is in no way directly singled out in the Sonoran Desert Conservation Plan (assuming that was the intended reference) - instead, Davidson Canyon occurs ***within*** one of multiple biological core areas identified across Pima County. Finally, the FEIS Table 118 (pg. 602) has a table of potential animal movement corridors that cover an area in and near the analysis area and encompasses nearly 500,000 acres.
Extent of Resource – Rarity. Less than one percent of Arizona's landscape supports wetlands. Since the late 1800's, streams and wetlands throughout Arizona have been modified or drained, resulting in the loss of more than one-third of the State's original wetlands.[225] [225] http://pubs.usgs.gov/wsp2425/state_highlights_summary.html	There are no wetlands on the Rosemont project site.
Desert springs. Often the sole sources of water for wildlife, desert springs support wetland ecosystems including rare and endemic species.[226] Human changes to groundwater are one of the greatest threats to long-term sustainability of groundwater dependent ecosystems in arid and semi-arid regions.[227] [226] Patten, P.T., Rouse, L., and Stromberg, J.C., 2007. Isolated spring wetlands in the Great Basin and Mojave Deserts, USA: potential response of vegetation to groundwater withdrawal. Environmental Management DOI 10.1007/s00267-007-9035-9. 16pp. [227] Ibid.	This paper is an interesting analysis of the impact of groundwater withdrawal on springs in the Great Basin and Mojave Deserts. Wetland ecosystems and the obligate plant species are also discussed. There are no wetlands at the Rosemont site. The discussion regarding springs in the FEIS Table 114, (pg. 556 to 561) illustrates the impacts anticipated from the fill (direct) are primarily associated with 7 springs (out of 95). Two of those springs are outside of the footprint for the preferred alternative (FEIS pg. 563) and three of the remaining springs have no riparian vegetation present. The remaining two springs impacted have xeroriparian with some mesoriparian habitat present. When the two springs are examined for flow conditions (FEIS, Table 109), the first Bee Spring is an improved spring with less than 1 gallon per minute flow (measured summer 2011) and Rosemont Spring has flow that has been measured of up to 0.79 gallons per minute during the observed period of 2007-2011. It is highly likely that ten springs may be affected by a drawdown from the pit (FEIS, pg. 562), because of this the Forest Service has required mitigation for this effect on springs by requiring Rosemont install up to 30 water sources to offset potential impacts (FEIS,

EPA Comment	Rosemont Response
	Appendix B, pg. B-32 to B-33) and also monitor springs and installed water sources for flow and condition (FEIS, Appendix B, pg. B-26 to B-27).
Cienegas. Desert wetlands also called Cienegas are located within the impact zone of the mine. They are high in biodiversity and provide habitat for migratory birds and wildlife, which is critical in an arid environment. Nineteen percent of federally listed endangered or threatened species in Arizona are directly associated with cienegas.[228] Endangered species, such as the jaguar and ocelot utilize this habitat, as well. Cienegas have been reduced or degraded since the late 19th and 20th century and are provided little protection. On US Forest Service Lands in the Apache Highlands Ecoregion, all cienegas are extant, while only two remain on BLM lands.[229] Minckley *et al.* (2013) found near-surface water availability as the limiting factor for the persistence of the Cienega. Given the rarity of these resources, Minckley *et al.* (2013) identifies conservation of this habitat as beneficial to the maintenance of global biodiversity.[230] [228] Minckley, T.A., Turner, D.S., Weinstein, S.R., 2013. The relevance of wetland conservation in arid regions: a reexamination of vanishing communities in the American southwest. Journal of Arid Environments. p. 216. [229] Ibid. [230] Ibid.	There are no cienegas on the Rosemont Project site. The BLM Cieneguita Wetlands are approximately 7.5 miles distant from the project site. The Supplemental Information Report (SIR) (pg. 66) discusses the information regarding these Cieneguita Wetlands. SIR (pg. 133) discusses the potential impact of drawdown if the assumptions regarding connection to a regional aquifer are correct. None of the impacts are associated with a fill activity. The reference used in 229 is correct, but there is an implication of a connection between land management agency and level of stewardship that is not accurately reflected in the rest of the paper. Appendix A neglects to mention that the article also found that 81% of cienegas on private land are extant.
Severity of Impacts – Functional Loss. Rosemont Mine is a large scale (*i.e.*, 4,750-acre footprint), long lasting (*i.e.,* >25 years of active mining with significant impacts lasting in perpetuity), high water consumption, extractive mineral mine anchored within a vast, interconnected, high-functioning, and undisturbed landscape. Thus, there will be significantly adverse direct and secondary project impacts to waters that will amplify throughout the watershed well beyond the immediate area of the project footprint. The environmental effects of direct and secondary impacts merge at the landscape scale of assessment through a break in the connectivity of aquatic resources (*e.g.*, stream networks) caused by a direct discharge of fill material resulting in significant adverse ecological effects. Sustaining important landscape-scale functions is not possible if supporting headwater streams are significantly degraded.[231] The filling of streams, the construction of a massive mine pit 2,000 feet in depth, and associated land clearing and related disturbances will dramatically alter in perpetuity project site topography, and surface and subsurface hydrology within the greater Cienega Creek and Santa Cruz River watersheds.[232] [231] Ibid. Levick *et al*. 2008. [232] Using Figure 58 of the PAFEIS and USEPA's NEPAssist mapping tool, EPA calculates that 1,000 years after active mining, the 5-foot drawdown contour will extend across approximately 42,000 acres of Cienega Creek watershed based on the Tetra Tech model and 64,000 acres based on the Montgomery model.	EPA characterizes actual impacts with modifiers that are not correct. Rosemont will actually have low water consumption when compared to other mines of its size due to the Dry Stack Technology employed. The characterization of the landscape as "vast, interconnected, high functioning and undisturbed" is also a reach when you consider the Rosemont site itself has been mined for over 100 years, there were two townsites located at the property (FEIS, pg. 882) and the remnants of a smelter and other mining infrastructure can be seen across the area. The FEIS (pg. 164-165) details the mining history of the area. Currently there are ranching activities throughout the area as well as wineries, quarries, and off-road vehicle recreation. The impacts EPA cites are not borne out by the FEIS analysis of the fill activity. The reference for 232 uses the PAFEIS to analyze a possible area of drawdown. The FEIS (pg. 339-350) discusses the potential drawdown effect of the pit in detail. Again, none of the impact discussed are associated with the fill activity.
Temporal Scope of Impacts –Permanence and Persistence. All the direct and most the secondary impacts to the aquatic ecosystem would be permanent and would persist in perpetuity. The construction of the mine would permanently fill 40 acres of waters and in doing so, would result in the fragmentation of a vast, intact, hydrologic landscape unit composed of hundreds of drainages covering many linear miles. The placement of fill would result in the loss of breeding and nesting areas, escape cover, movement corridors, and food sources for wildlife associated with existing waters on the mine site. Wildlife species and communities that depend on large, intact habitat blocks would be irreparably harmed by the mine project. Secondary impacts will cause serious degradation or complete destruction of special and regionally unique aquatic resource areas downstream of the project. Many of those aquatic resources are unique because of their ecological diversity, and because they are difficult to restore once lost or degraded. Impacts from the mine would be irreversible.	Rosemont plans to fill 40 acres of waters, which will change the landscape. However, the Forest Service requires mitigation associated with the impact to the land surface including but not limited to: reclamation of the site to meet specific plant cover requirements, replacement of surface waters to reduce the impact of spring losses, plus monies to ensure bird habitat is replaced, invasive species are controlled, and projects within the Cienega Creek basin can be completed. None of the mitigation elements associated with the other permits issued, other agency requirements, or mitigation offered by Rosemont have been acknowledged or evaluated by the EPA in this analysis.